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Automobile Sales and the Engineer

Mr. Moskovics' long experience in both the sales and engineering branches of the automotive industry provides an unusual background of experience on which to draw for such an article as this. His justification of automobile merchandising on the installment plan will hardly meet with the approval of some economists but his vision of the future of the industry cannot fail to awaken interest.

By Frederick E. Moskovics
Vice President, Franklin Automobile Co.

THE DISTRIBUTION problem of the automobile industry is certainly not becoming easier. True, it is not necessary to prove to a man that he ought to own an automobile before he can be separated from his roll. The automobile as a necessity is thoroughly sold. Everybody wants a car, and the real job of the retail salesman is to fit him out with the car he should have and that best meets his pocketbook.

The year 1923 was the high point of the industry in volume of units sold, but a strange situation existed in that the average business of the individual dealer was less than in 1919, meaning, of course, that more dealers participated in the business. There is a great question in the industry today as to whether the profits of the dealers were sufficient to justify the investment and the question arises: Are there too many dealers? Concurrent with that is the problem whether the dealer is taking advantage of all his opportunities. Is he training himself in the economics of his own industry? Is he taking advantage of the opportunity to sell parts, accessories and supplies? This business is slipping from him into alien hands when, by all means, he should have it.

We have reached the stage of purchasing motor cars on the installment plan. A few economists hold up their hands in horror at the effect this method of buying is going to have on business conditions, but—aren't most of our utilities bought in just this way? And what utility better serves the American workman and the American business man than a motor car? Anything that will contribute to the material welfare of humanity is a distinct asset to mankind, and the motor car which will take the workman to his work more quickly; permit him to spend more time with his family; permit him to take that family out in the evenings, on Saturday afternoons and Sundays into the God given sunshine on the hillsides and rivers, is adding a distinct something to that family. Consider what it has done to suburban life. Consider the effect it has had on the real estate business. Men have invented all sorts of devices for spreading the payments for their homes, washing machines, furniture, pianos, etc., over a period of years. Why shouldn't they purchase their transportation on the same basis?

The automobile market itself has not reached the crystallization stage but installment sales indicate its approach.

A factor that will eventually have a limiting effect on motor car sales is the traffic problem. If you have any doubt about its acuteness, try to cross Broadway at 34th Street on a weekday afternoon or any of the side streets feeding into Times Square at theater time in the evening. Many New Yorkers have given up their motor cars entirely because of the crowded traffic conditions which practically eliminate the possibility of parking anywhere near a business office or a big store.

I have mentioned New York traffic because I am more familiar with it, but every city has its Fifth Avenue

and Broadway where congestion relatively is just as bad. In Los Angeles they have made calculations of street areas on the basis of square feet per car which indicate that, at the present rate of growth, a basis of cars per square foot in the near future will be necessary unless more streets are provided.

What can be done to lessen city traffic congestion? The National Automobile Chamber of Commerce has recently appointed a committee to work on that one problem. So far as I can see the only solution for New York is elevated roadways on steel structures somewhat like the present elevated railroads. And at this point the structural and highway engineers must combine forces to make possible more automobile sales. The effect of the structural engineer's activities on automobile sales may not be very direct but eventually it can be positively traced.

Good Roads and Automobile Sales

The highway engineer and his functions, however, go hand in hand with motor car sales. Until good roads come to rural communities, the motor car cannot fulfil its best mission. The average farmer can get more real dollars and cents value out of a car than can most of his city brothers but generally he cannot afford to maintain one for summer use only.

Main through highway routes which the highway engineer must build are also factors in automobile sales, particularly those roads which run north and south and which run to the balmy climates of the coast. A growing class of motorists, not restricted to the wealthy by any means, roll south and west each winter, and west and east in the summer, most of them camping along the way and traveling at a very moderate expense. Many more would like to join this class and many certainly will as the roads get better. They will sacrifice other desires to get the cars to migrate in.

To give you an idea of the extent of this migration, it is estimated that for a period of four months last winter an average of 3,300 cars daily entered Los Angeles County. And from what I can learn, the migration to Florida this winter is even greater. This migration to changed climatic conditions is partly responsible for one of the biggest problems of the automobile engineer, who, after all, holds in his hands the most vital factors of automobile sales. He must design a transportation unit that will perform efficiently in the hands of an unskilled operator under below-zero conditions in the northern climate, as well as in the steady 100-degree temperatures of the tropics—not so simple a job as it sounds.

The motor car designing engineer faces a problem that is unique in mechanics. He knows less about the actual conditions under which his product must operate than any other engineer. Conditions to be met by the designer of a locomotive are absolutely known. The locomotive runs on fixed road beds, pulls definite loads up specified grades and in predetermined climatic conditions, utilizing known and standard fuels, and in the hands of experienced operators, both as to maintenance and operation.

The designer of the steamship knows all his maximum stresses of wind and weather, load, power, water and fuel. Even the designer of an airplane has a more definite knowledge of the actual conditions to be met. The air is far more uniform an element to travel on than American roads. The airplane engine is practically a constant speed mechanism. whereas the motor car engine must be flexible, running from 100 r.p.m. on up, and it must be capable of working under full-load conditions at practically all speeds.

That the motor car engineer is searching widely for the answer to his many perplexing problems is evident from the great number of radical designs today on the market. The mechanical side of the industry is more open today than it has ever been. For instance, there are five mathematically different kinds of eight-cylinder engines on the market, many kinds of transmissions and spring suspensions that are as varied as the flowers in the field. There are proponents and opponents of four-wheel brakes, and an infinity of designs in four-wheel brakes.

And there is the fuel problem to be considered. Chemical engineers are hard at work in an endeavor to get more and better fuel out of our steadily diminishing petroleum reserves. There are many kinds of anti-knock compounds now being tested, several of which are on the market. At least one is doubtless based on sound mechanics. If it proves a success, as now appears likely, it will occasion mechanical design changes from radiator to rear axle, because it will mean that the engineer can increase his m.e.p., which in turn would mean a lighter motor to do the same work, which in turn would mean a lighter car, and which in turn would mean changes of other fundamental parts.

My own feeling is that, great as have been the mechanical strides in motor car design in the last ten years, they will be greatly surpassed by the developments of the next ten, and to my mind these changes offer the best solution to the used car problem. These changes will be so radical and costs of operations, comfort and appearance so changed and improved that the cars of today will be obsolete.

So you will see that the mechanics of the motor car certainly have not reached a crystallization stage. Isn't it clear that the motor car engineer has an important effect on motor car sales? I have tried to show the part to be played eventually by civil, electrical and chemical engineers, but the real sales engineer of the automotive industry is the designer, the engineer who lays out his visions on the drafting board and whips them into shape in the laboratory and over the road.

A French National Cutlery School

The French cutlery industry has by a consistent campaign succeeded in getting consideration for a government grant for the establishment of a cutlery school at Thiers in mid-France, the center of the industry. As with many other trades there has been a migration of the youth of the district toward the big centers where they may enter other trades to the neglect of this and other really important French industries that are actually needing efficient labor to a greater extent than is available. Various other French trade schools are also established in a similar manner.

The demand was made of Monsieur Labbé of the Educational Department who stated that it would be incorporated in a plan for the reorganization of the present system of secondary and technical education which was at the present time under discussion.

Doubtless, with the general elections but a few months away, the demand was well timed, but aside from any political significance there is no question that the idea is one that should be encouraged.

Hollow Connecting Rods in the Making

By Fred H. Colvin
Editor, *American Machinist*

The first article—Operations on the connecting rods for Wright airplane engines—Special fixtures and methods for securing light weight, accuracy and ample strength

THE connecting rods of the Wright aeronautical engine are different from those usually found in engines of V-type design. Not only are the rods round and hollow, but the construction of the rod with the double bearing is quite different from usual practice. Although it will be necessary to describe the making of each of these rods separately, many of the operations are the same, or so similar that it will be best to study them both together to secure the fullest informatilon as to the methods used.

The problems involved can best be appreciated by studying the details of what is called the "outer" rod, in Fig. 1. While this rod goes between the forks of the other rod it also bears "outside" the crank pin. Fig. 1 not only gives the main dimensions, but gives the tolerances and also gives an idea of the kind of workmanship demanded. The enlarged section at *A*, shows the slight bevel of 0.005 in. for a distance of $\frac{1}{8}$ in. each side of the joint to relieve the tendency to bind at this point.

The steel is S. A. E. 3140, having an elastic limit of 105,000 lb.; elongation 17 per cent; impact test 40 on an Olsen machine; and a Brinell hardness of 260. The hole in the rod must be smooth and free from tool marks, with a maximum eccentricity of 0.025 in. The bores of the two ends must be parallel within 0.002 in. in 3 in. and the sides, or faces, of the large end must be parallel and at right angles to the bores within 0.002 in. The joint surfaces must be smooth and flat, so as to bear properly.

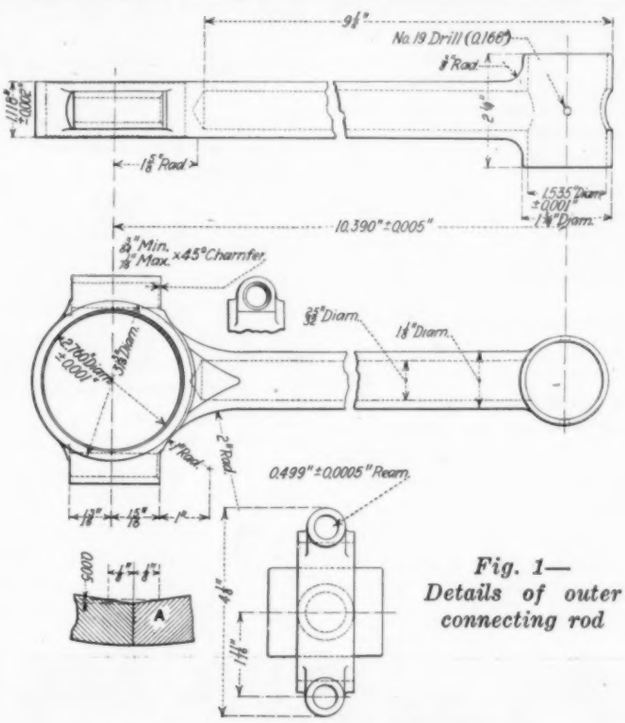


Fig. 1—Details of outer connecting rod

OUTLINE OF OPERATIONS

Rough disk grind	Rough face crank end
Center both ends of rods	Rough bore hole in crank end
Turn shank	Elongate hole $\frac{1}{16}$ in.
Grind shank	Form mill ends of bolt bosses
Drill piston pin hole	Drill two bolt holes
Rough face piston pin end	Mill bolt lock
Hollow mill piston pin end	Circular mill
Finish face piston pin end	Mill cap free from rod

After preliminary inspection, tests for hardness, snagging, etc., the sides of the crank end are disk ground to remove scale, both ends are centered and the central portion of the rod is turned and ground. Two tools are used in turning in the Lo-swing lathe to cut the time in half. The grinding is done on a Landis machine to 1.125 ±0.001 in. Inspection follows each operation.

The piston-pin hole is next drilled in the four-spindle Barnes machine, shown in Fig. 2. A little study will show the construction of the fixtures. The large end is located by the flat sides which have been ground. The rod is clamped by the round portion while a substantial casting holds the removable bushing.

The line up, shown in Fig. 2, handles a number of operations, including drilling, rough boring and reaming the piston-pin hole, rough and finish facing the ends, hollow milling, rough facing and boring the large end as shown at the third and fourth stations.

Special tools and fixtures, as in Figs. 3, 4 and 5, are used to elongate the large hole $\frac{1}{16}$ in. so as to allow for the metal removed in cutting off the cap. The elongation of the large hole in the connecting rod is done on either a No. 4 Cincinnati milling machine or a Foote-Burt drilling machine. The first method is illustrated herewith. A side view of the fixture is shown in Fig. 3. The rod is located by the piston-pin hole as at *A*, the large end being supported by an angle block or plunger *B*, which is forced up by a

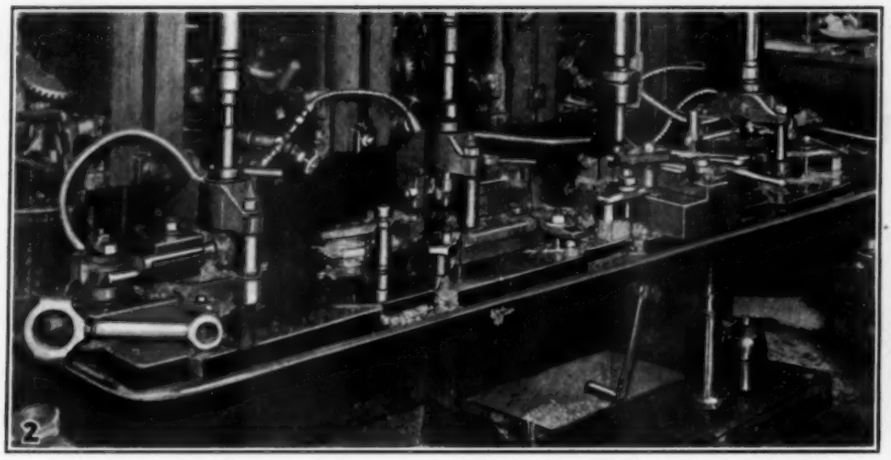


Fig 2—Drilling and reaming rods.

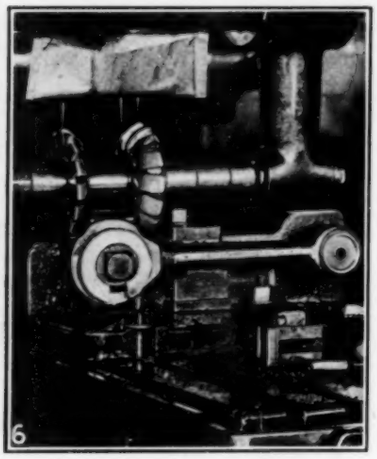


Fig. 6—Milling ends of bolt bosses

spring beneath and locked by the screw *C*. One of the angular locking screws at the top is shown at *D*. The rod is clamped at *E*.

With the rod in position, the gage, Fig. 4, which is a piece of ¼-in. plate steel, is put on the fixture as at *F*,

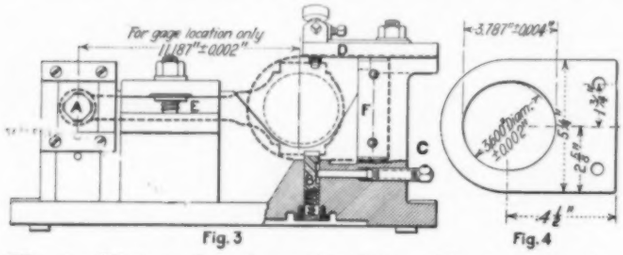


Fig. 3—Fixture for elongating hole. Fig. 4—Gage for setting fixture

Fig. 3, being located by the two dowel pins shown. This gage is used in connection with the cutter, for setting the table stops on the milling machine so that the hole will be elongated just the right amount, $\frac{1}{16}$ in. It is used only on the first piece, for setting up the job.

The cutter used is shown in Fig. 5. The arbor has a No. 11 Brown & Sharpe taper shank with a draw-in bolt and slot for driving lugs or keys. The cutter is made separately, as shown at *A*.

The ends of the bolt bosses are straddle milled with a pair of form cutters as shown in Fig. 6. The rod is positioned from the piston-pin hole, the large end fitting over a stud and held by the C-washer shown. The rod is clamped by the round portion near the large end. The position gage used allows 0.005 in. for polishing.

The two bolt holes are next drilled $\frac{13}{16}$ in. diameter,

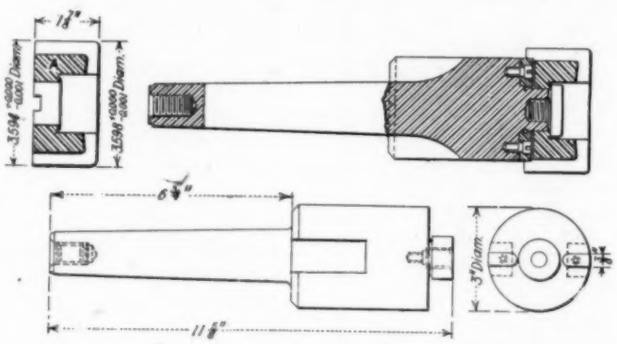
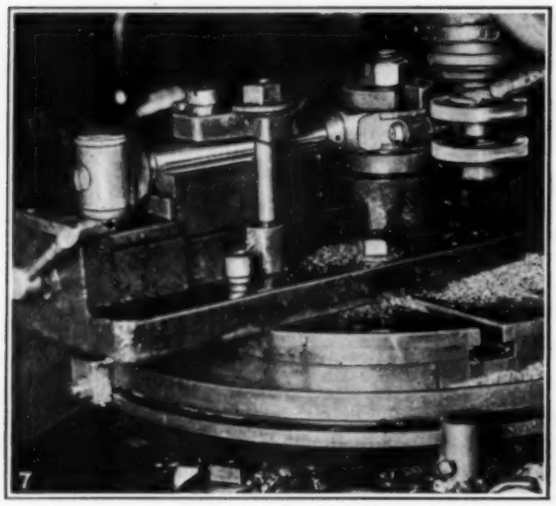
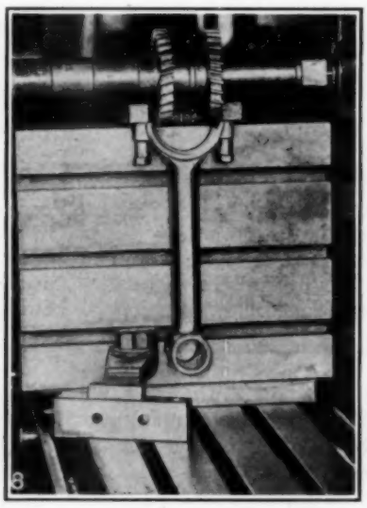


Fig. 5—Boring tool for elongation

rough reamed to 0.494 in. with a tolerance of ±0.001 in., and finish reamed to 0.499 in. with a tolerance of only 0.005 in. A small radius is milled and then the bolt-head lock milled to prevent the bolts from turning.





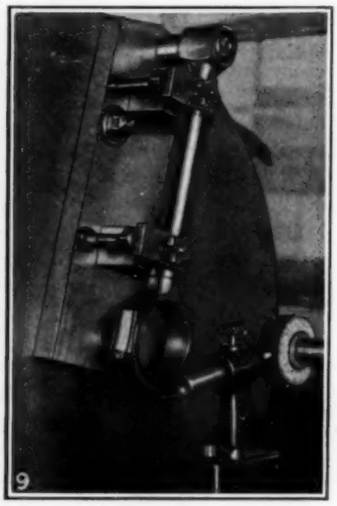


Fig. 7—Straddle milling large end. Fig. 8—Milling bevel at joints. Fig. 9—Grinding the large end

A large radius is turned at the big end of the shank, this being shown in connection with the other rod. In a similar way the milling of the surplus stock from the piston-pin end of the rod and the drilling will be shown in the next article.

The circular milling of the large end of the rod is shown in Fig. 7, a pair of straddle milling cutters, milling both sides of the bolt bosses. This view shows the rod located by the large end and clamped in the center. Fig. 8 shows the slight beveling of the rod at the joint. The rod is held in position by cap screws which bolt it up against the projecting ears of the fixture, the vertical position being determined by the piston end and the angle plate.

The final finishing of the large bore is by grinding as shown in Fig. 9. The special faceplate carries a fixture which locates the rod from the piston-pin hole, and holds it by the two clamps shown, so that the large hole is central with the spindle of the grinding machine. The rest is easy, the wheel being kept sharp and true by the truing diamond shown in position.

The rod is polished on a walrus-hide wheel, after which it is finally inspected and goes to stock, ready for assembly.

Machinery Will Not Produce Power

By J. C. Adams

THE DESIRE to get something for nothing, to eat the cake and have it, seems to persist regardless of the advance of knowledge and science. No longer do learned men try to change the base metals into precious ones, though even this rainbow chasing has been brought back to feeble life since the Curies discovered radium. Now-a-days if we want to enhance the value of base material we do it by work, skill, art. Work and skill convert pig iron into hair springs for ladies' watches and a pound of iron becomes of greater value than a pound of gold.

Changing the qualities of materials is an every day business but no longer do we try to change their nature —that is, most of us. We generally laugh at a man who tells us that he can make two times two equal five or anything but four; but not always. The man who invents a green liquid of which a few drops will change ordinary drinking water into fuel for an automobile still finds an audience and every now and then when somebody discovers a method to burn ashes and heat our houses with what we now throw away we hear some people say: "Well, why not? So many wonderful things are done these days."

On the whole we are pretty well convinced of the uselessness of such attempts and the mechanic especially is hard to catch by the would-be benefactor of mankind, harder than the average man with perhaps the exception of scientists. It is just because he is so skeptical that it comes like a shock when we see him trying to do with power, with energy, what he would never try to do with material.

Getting 25 Hp. from a 7½-Hp. Motor

It is not so long ago that I had a conversation with a man who understands machinery, a man who is no fool, who would never buy a gold brick or invest money in a scheme to make two tons of coal out of one ton. The conversation was about a machine driven by a 7½ hp. motor. I remarked that the motor was not powerful enough for the work intended. I claimed that the cuts would require not less than 25 hp. and was countered with the remark: "Well we can gear the machine up to give you 25 hp." Mind, he was not going to put a 25 hp. motor on that machine but keep the 7½ hp. motor and gear it so that it would develop 25 hp. I might have forgotten this incident if it had not happened a few days later that another man equally familiar with machinery made the same claim for his motor on his machine. Again he was going to gear a 7½ hp. motor up so that it would develop 25 horsepower.

A number of years before these incidents occurred I was connected with a concern manufacturing mowing machines and other agricultural machinery. The mowing machine was provided with what is commonly known as the wobble gear. It was found that under certain conditions two farm horses could not conveniently pull the machine and so I was instructed to provide the necessary tools, etc., for a wobble gear of which the elements should be about 25 per cent larger in diameter. I asked, of course, whether it was meant that the gear ratio should be increased 25 per cent but was told that such a thing could not be done. The gear ratio must remain the same. The object of the larger gears was to give more *power*. I asked: "Are you going to put more horses on the machine?" But this was not the case. Two horses would have to pull the machine as before but by some mysterious process which I have never understood these horses would be made much stronger and could pull harder by merely making the two gears in the machine of larger diameter. At the end of a week the whole place was divided into two camps: those who believed that the gears would increase the power and those who believed the other way. And the ayes had a large majority.

We Still Want Something for Nothing

This was a number of years ago and one might expect that the mechanical world had become wiser but recent conversations have convinced me that the old leaven in still working. The old desire to get something for nothing, of increasing the number of dollars by piling them up in various ways is still there. It seems to be necessary periodically to announce the fact that power or energy cannot be increased by any kind of mechanism. The best we can hope to do is so to arrange our machine that a minimum of power is wasted. But, however successful we may be in this regard, some of it must be wasted. There is absolutely no hope that we will ever succeed in using a bit of energy without some waste. And as to the idea that we can take a certain amount of energy, drive a machine with it and get more energy out of it than we put in, this is worse than hopeless, it is foolish.

In the class room of the apprentice school of the Reo Motor Car Co., is this motto:

"There will always be a place for the man who knows how—but the man who knows *why* will always be his Boss."

Others besides apprentices might well learn it to advantage.

Fabricating Steel Cylinder Heads by the Oxy-Acetylene Torch

Taken from *Oxy-Acetylene Tips*

QUITE frequently job welding shops are called upon to do production welding for various manufacturers in their vicinity. Because of their fund of knowledge and experience gained through extensive and varied uses of the process, they are enabled to see and seize opportunities where its application will make possible a profitable line for production.

Such was the case with a job shop located in one of the great mining centers of the West. The welders

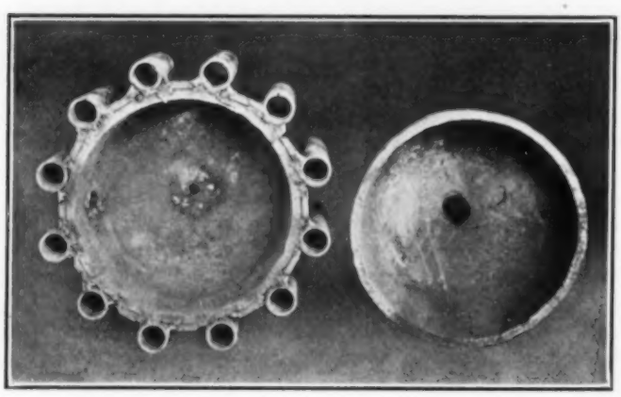


Fig. 1—First stages of fabrication

had been called upon to repair many cracked and broken cast cylinder heads for the one- and two-cylinder type of gas engine commonly used in the mining industry. Knowing the possibilities of applying oxy-acetylene welding to production as well as to repair work, they saw an opportunity for a very remunerative business.

Broken cast cylinder heads were causing their customers serious and expensive delays, and the men from the job shop realized that could they perfect a head with dependable lasting qualities there would be an extensive demand for their product. So they set about the task and did perfect and are now manufacturing and distributing an all-welded head.

The head is fabricated entirely of steel by oxy-acetylene cutting and welding. A piece of ⅜-in. thick rolled steel plate is cut to the required diameter. This plate is then heated and placed in a press where it is cupped to correct dimensions in the form shown by the right-hand view in Fig. 1. Then as shown on the left, twelve 6-in. pieces of extra-heavy steel tubing, later to serve as bolt holes, are equally spaced about and welded to the outside of this cup. The necessary lengths of ¼-in. steel plate are also welded to the outside of the cup between the tubes for the purpose of building up the face for finishing and to provide a larger gasket bearing surface. At this point in the construction an exhaust port is oxy-acetylene cut through the rim of the cup, and in this hole is welded a short nipple.

The next operation is to weld vertical pieces to the sides of the tubes. These pieces form smooth square side walls for the water jacket openings between the tubes and further reinforce the head. Then a band of steel slightly narrower than the length of the tubes is added, and entirely surrounds the head except for the space taken up by a flange which is welded to the nipple from the exhaust port. This band is welded to the tubes, to the vertical pieces at their sides and to the flange, and clean out holes later to be equipped with plugs are cut through it.

The head now appears as shown in the lower left-hand view of Fig. 2. Then a small spark plug hole is cut through the center of the cup. On the outside of the cup and surrounding this hole a short nipple is welded.

A steel disk equivalent in diameter to the outside of the head and containing holes through which the tubes and nipple surrounding the spark plug hole project slightly, is then oxy-acetylene cut and slightly dished. Before placing this disk, which with the circumferential steel band forms the outside of the water jacket, all surfaces which are to come in contact with water are treated with a creosote paste to prevent corrosion. The disk is then placed on top of the head as shown at the left of the illustration and welded to the band, to the tubes and to the nipple surrounding the spark plug opening. The completed head appears as shown by the top and right-hand views in the illustration.

Many advantages are claimed by the manufacturer for this oxy-acetylene welded head. It is practically

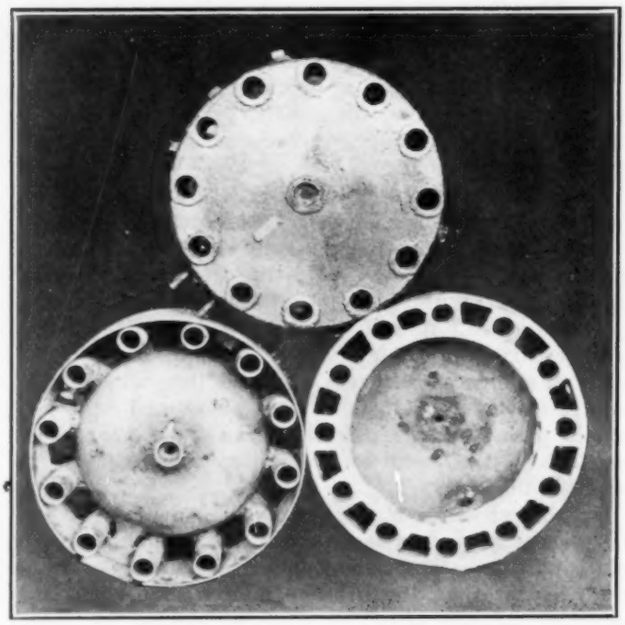
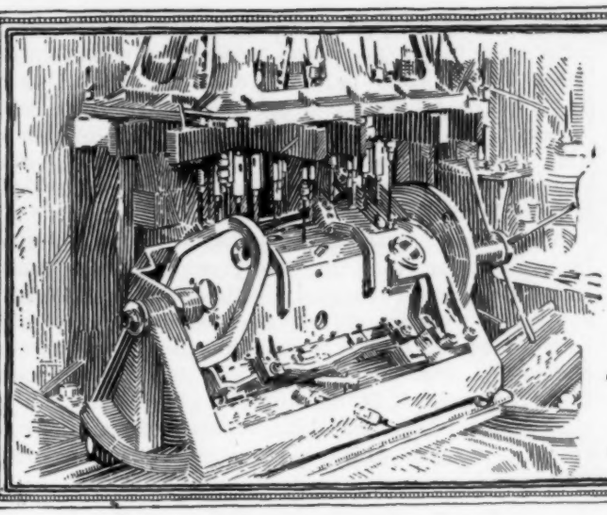


Fig. 2—Last stages of the work and the completed head

indestructible. The tubes forming the holes for the cylinder bolts protect the latter from water, thus preventing the head from becoming rusted to the bolts. Contraction and expansion do not seriously affect the outside of the water jacket. The head is light and easily handled. Larger cooling space is provided, thus improving engine operation by preventing knocking due to premature explosions in the firing chamber.

It is obvious that the advantages of the head are due not alone to its design. The fact that it is constructed of a ductile metal, rolled steel, contributes greatly to its qualities. And the fact that there is no feasible way of fabricating these heads on a production basis except by the oxy-acetylene process demonstrates the value of the process for such work, and the opportunities which are available to the enterprising job shop management.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Speeds and feeds of machine tools—Definition of cutting speed—Relation between speed and feed—Points in design affected by speeds and feeds

THE majority of tool designers know very little about machine feeds and speeds unless they are fortunate enough to have had a considerable amount of shop experience. Even if they have had this experience, many men would not realize the importance of the subject sufficiently to make notes as to the results obtained when using certain speeds and feeds on certain kinds of material.

The majority of shop men understand in a general way what is meant by a statement that a certain kind of material can be cut at "so many feet per minute." The tool engineer also has a general idea of the matter, although he may not know much about the various factors which must be considered when determining the correct feeds and speeds for a given kind of material. We all learn by experience and, although this is costly, yet there is no other way whereby a man can become thoroughly familiar with this phase of tool engineering except by practical application of thoroughly understood principles gleaned through actual shop work.

In order to obtain the highest production and greatest efficiency from any machine tool, it is necessary that the feeds and speeds used should be made the subject of careful study. It can readily be understood that small differences in speeds and feeds may easily amount to a great deal in production work, so that the number of pieces produced per hour will be greater or less, according to the ratios used.

Importance of Speeds and Feeds

To take a specific example, let us assume that a certain piece of work is being produced in ten minutes, using a given feed and speed. If it were possible by slightly increasing the feed and speed to produce the same piece of work in eight minutes, it is evident that a saving of 20 per cent would be effected. Such savings as this are entirely possible in many cases, if the tool engineer understands thoroughly the requirements when cutting different kinds of material. We do not wish to digress from the general subject of tool engineering in order to take up the matter of machine feeds and speeds, but at the same time we must point out the importance of the matter and give as much information as possible that will be of assistance to the tool engineer.

While we believe we can assume that the majority of tool designers understand thoroughly the meaning of the term "cutting speed in feet per minute," there may be a few beginners to whom the matter is not perfectly clear. For the benefit of these we give the following brief explanation: The number of feet of metal considered as a continuous ribbon which passes a given point on the edge of a cutting tool in one minute, is the cutting speed in feet per minute. For example, if the circumference of a piece of work is exactly 3 in. or 0.25 ft., and if it is revolving at a speed of 240 r.p.m., the cutting speed is 60 ft. per min., because 60 ft. of metal pass the cutting point every minute.

To take another example, let us assume that we have a piece of cast iron 16 in. in diameter which is revolving at the rate of 12 r.p.m. In order to determine the cutting speed, the problem would appear as follows:

$$\frac{16 \times 3.1416 \times 12}{12} = 50.27 \text{ ft. per min.}$$

We can readily obtain a constant between 3.1416 and 12 by dividing the first of these figures by the second and thus obtaining the figure 0.262. This simplifies the problem so that in stating it once more it would be:

$$16 \times 0.262 \times 12 = 50.27 \text{ ft. per min.}$$

In order to reduce the matter to a formula, the statement would be as follows:

Let D = diameter of work;
N = revolutions per minute;
C = cutting speed in feet per minute.

Then, $$D \times 0.262 \times N = C$$

If we reverse this process in order to find the number of revolutions required for a piece of work of a given diameter to obtain a certain cutting speed, we would use the formula as follows:

$$\frac{C}{D \times 0.262} = N$$

If we know the number of revolutions per minute which a piece of work is making while being cut, and if we also know the feed per revolution we can easily determine the number of inches or fractions of an inch which will be machined in one minute. Also, if we

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determine the rate of speed at which a given piece of work can be run, if we establish a feed for it and if we know the length of the work, it is a very easy matter to figure the length of time necessary to make the cut. As an example, let us take a piece of work 4 in. in diameter which is revolving at 50 r.p.m. The length of the work is 5 in. and the feed 0.040 in. per revolution. The length of time necessary to make the cut will be as follows:

$$\frac{\text{Length of cut in inches}}{\text{Feed in thousandths of an inch}} \div \text{r.p.m.} = \text{cutting time.}$$

In our problem, this would appear as follows:

$$\frac{5.000}{0.040} \div 50 = 2\tfrac{1}{2} \text{ minutes.}$$

It is a comparatively easy matter to figure the length of time necessary to perform any cutting operation if the feed and speed are known. In estimating work, the feeds and speeds must be determined by the estimator, and he must understand thoroughly the principles which govern and influence these points. It is unnecessary for the tool engineer to be familiar with all the problems which confront the production engineer, yet, at the same time, he should understand enough about the matter to realize its importance and its effect on tool design. We shall give as briefly as possible a few important matters which really have some effect on the design of tools, jigs and fixtures, and we shall point out a number of important facts which have an influence on the subject.

The Relation of Speed to Feed

There does not seem to be a fixed relation between feed and speed, yet a high speed will not permit a coarse feed, so that we are really able to say that an increase of speed usually means a decrease in feed. An important factor in any kind of production work is the amount of stock which is to be removed from the work. When a great deal of material is to be taken off, as is sometimes the case with steel forgings, the chip produced by the cutting tool will naturally be heavy and the speed must be slowed down correspondingly. The amount of pressure brought to bear on the tool and the amount of power required to pull the tool through the work are important factors.

The finish allowance on cast-iron parts of moderate size, say 4 or 5 in. in diameter, is usually not more than $\frac{1}{8}$ in. on a side. As the work grows larger, a greater allowance is made on account of the probability of variations in the casting. When work is to be machined accurately to size, two or more cuts are usually necessary in order to keep the work within the required limits. The tools used for heavy cutting must always be proportionately larger than those used for light work, as the heat generated by the cut is so much greater in one case than in the other. The tool engineer must bear this matter in mind and remember at the same time that the power of the machine has an effect upon the design of the tools, because the heavier machines need tools and fixtures to correspond with the class of work for which they are intended.

We give herewith a list of different kinds of materials and the cutting speeds which can ordinarily be considered safe when a normal amount of material is to be removed. It must be remembered, however, that there are a great many factors which influence the speed, and they must all be taken into consideration when determining the rate at which a given piece of work is to be machined. The tool engineer is not usually called upon to set speeds and feeds for production work, unless he is closely in touch with the production department or estimating department. It is our belief, however, that the tool engineer who has a broad knowledge of subjects closely allied to his own work, is much better fitted to design tools than one whose knowledge is more limited.

In giving the cutting speeds herewith, we call attention to the fact that they are given only as a general guide for work of the kind specified, and the speeds are subject to considerable variation according to the nature of the material, the machine used, the tools furnished, the lubricant provided, and the amount of stock to be removed. It is impossible to give a hard and fast rule for any particular kind of material, as there are so many factors which have an effect on the cutting speed.

Cutting Speeds for Different Metals

Material	Cutting Speed, Ft. per Min.
Cast iron	50– 60
Cast steel without lubricant	40
Cast steel with lubricant	60
Malleable iron	60– 70
Machine steel forgings	50– 60
Tool steel forgings (alloy) (depending on alloy)	30– 50
Yellow brass	150–200
Composition brass	120–150
Bronze castings	40– 70

In all kinds of production work the setting of feeds and speeds is a very important factor in obtaining the maximum efficiency of tools and fixtures. The average manufacturer probably loses more money in the course of a year by not giving sufficient attention to this matter, than by any other single cause. There are a number of things which are responsible for this situation, but in all probability the tendency of the workmen to make the tools run as long as possible without regrinding, is one of the most common. Modern factories do not usually allow the workmen to grind their own tools, and a duplicate set should always be at hand ready to put in place when those in use become dull.

The Tool Must Fit the Work

The kind of tools used, the angle at which they are ground and the way they are supported in the holders are all important factors which influence the speeds and feeds. Every foreman of a department engaged in production work should make sure that the workmen understand the value of time, and should never permit the feed or speed to be changed in order to make a tool last longer, always assuming that a reasonable number of pieces is being produced between tool replacements.

It is a fine thing for a theoretical man to determine beforehand the exact speed at which a certain piece of work can be run, but it is entirely different to tell the workman in the factory that he must adhere to the speeds and feeds specified when he has run across a piece of material which burns the tool and destroys the edge as soon as he puts it to work. It is really impossible, without knowing exactly what the quality of a given piece of material is, to specify the cutting feed and speed. Much can be done, however, by a careful inspection of castings and forgings before machining, and by insisting upon uniform grades of materials bought by the factory. A great difference in the

life of tools is found if castings are sand blasted, properly pickled and annealed before machining, and the progressive executive looks into these points very carefully if he wishes to obtain maximum production.

The remedy for such conditions is apparent, and it is certainly not economical for any manufacturer to reduce his production program because one lot of castings or forgings is harder than it should be. When machining speeds and feeds are fixed and a lot of hard castings are encountered, the parts may be sent back to the foundry for additional treatment, providing that this does not hold up the production as a whole. Otherwise it may be necessary to machine them as they are, at reduced speeds and feeds.

Points in Design Affected by Feeds and Speeds

In the design of tools there are a great many points which are vitally affected by the cutting speeds and feeds used on the work. At first thought, these points do not appear to be of so much importance but in considering the matter, it will be evident that the subject has really a broad effect on tool design. In order to bring out some of the points of importance, we list them herewith and also state the effect which each one has on the subject.

(1) *Material.*—As the nature of the material affects the feeds and speeds, so also it affects the tools, for with material not requiring a lubricant, no provision need be made for it, while in the case of material which requires a cutting compound, the tools must be designed to suit the condition. So also the amount of stock removed makes a great difference in the design, both of the holding devices and of the cutting tools.

(2) *Method of Holding Work.*—If a piece of work is to be machined at a very coarse feed and if considerable stock is to be removed, the method of holding must be particularly designed so as to resist the heavy cutting action of the tools without vibration or the possibility of shifting of the work under the cut. If a fixture is to be run at high speed, yet without a great amount of stock removal, care must be taken to see that it is properly balanced, so that it will run without vibration. We have pointed out the necessity for counterbalancing certain kinds of fixtures in our articles on turret lathe work, and it must be remembered that although the work itself may not be large, the fixture which holds it may be of irregular shape and also of considerable size, so that it must be properly balanced in order to run as it should.

(3) *Chip Clearances.*—When work is revolved at a slow rate of speed and the material is such that the chips are heavy, due to a coarse feed, both the fixture and the tools used must be so made as to allow the chips to get out as fast as they are made. If this is not done, much trouble will be caused, and in all probability the work itself may be marred by the abrasive action of the accumulated chips. Certain kinds of fixtures which are of such a nature that they have a number of bosses or pockets in them, should be made so that they can be readily cleaned when chips accumulate or tangle themselves in various parts of the fixture. If the cuts taken are light, little trouble is usually found; but in the case of steel castings, when considerable material is being removed and the chips curl up, the matter may often become serious unless it is properly taken care of in the design.

(4) *Angle of Tools.*—The angle at which tools are ground and presented to the work affects the feeds and speeds to a great extent. The materials of which the tools are composed are also important factors, as high-speed steels, carbon steels and Stellite tools all run at different speeds and are subject to different rules, both as to grinding and upkeep. The use of Stellite for cutting tools has increased rapidly in the past few years and high-speed steel also is very commonly found in all classes of high production work. Carbon steels are still in use, however, as for some kinds of very fine forming tools which cannot be run at high speed, yet which do require a very keen edge in order to obtain the proper cutting action. All of these matters have a vital effect on the speeds and feeds for any given kind of material.

(5) *Milling Cutters.*—The number of teeth in a milling cutter and the spacing of the teeth, combined with the angle at which they are set and the method of presenting the teeth to the work, all affect the feed and speed used. We have mentioned a few matters in connection with the design of milling cutters in some of our previous articles, and it is unnecessary to repeat any of this material at this time, yet its importance is such that we earnestly request the tool engineer to give it the consideration it deserves. The power of a milling machine and the application of this power to the cutters and to the feed are matters which are receiving a great amount of attention from production men throughout the country at present. While we have no space here to treat the subject broadly, we suggest to the progressive engineer that he obtain all the information possible, both in his own shop and also from the articles published in leading periodicals.

(6) *Effect of Lubricant.*—We have previously mentioned the importance of cutting lubricant and its application to cutting tools of various kinds. We must also emphasize its importance as applied to the increase of production, by permitting heavier feeds and higher speeds. The data obtainable as to the increase of speeds and feeds possible by the use of a suitable cutting lubricant is not great; but we know that greater production can be obtained and a much better grade of work also if the lubricant is properly applied and of a suitable character.

General Notes

The amount of feed and speed which can be used for any work produced in quantity, should be as great as the nature of the material will permit without too great an expenditure of time for changing tools after regrinding. It is much better to change tools four or five times a day, if a corresponding increase in production can be obtained, rather than to run a single tool all day and produce a smaller quantity of material. While it is impossible to set the most efficient speeds and feeds for a given piece of work without a test of the material, after this value has once been made, any other work of the same kind should be produced at the same rate. If this last is found impossible, it must be due to faulty cutting tools or a variation in the quality of the material. In either case, the remedy is obvious.

In modern factories, there are usually several men whose duty it is to set the speeds and feeds for the different departments and to see that there is no departure from these after they have once been set. If it is found that the set speeds or feeds cannot be used without undue wear on the tools, the matter must be taken up with the production engineer who is in charge of the work, before any changes are made.

He can then determine where the trouble is and apply a suitable remedy.

The tool engineer who is progressive will realize the importance of the subject of speeds and feeds to his own work, and will endeavor to increase his information on the subject whenever possible, both by observation in the factory and by diligent reading on the subject whenever or wherever he finds any article of interest. It would be possible for us to give a great deal more information in regard to the figuring of speeds and feeds, but we do not think that it is essential for the present series.

Comparative Cost of Electric Traveling and Gantry Cranes

By William L. Laing

IN THE course of service with a prominent firm of crane manufacturers the writer has often been asked which type of crane, gantry or overhead, will be cheapest in first cost.

In a recent case the question was: "If you have prepared any data on the subject we should be glad to have you advise the relative cost of serving a given number of square yards with the use of gantry cranes as compared with overhead traveling cranes.

"As you will need a little more definite information regarding our requirements, would state the space to be served is 100 ft. wide by 1,200 ft. long and will need two cranes of 10 tons lifting capacity, equipped with 65-in. magnets."

It is difficult to make any hard and fast rule as to the most economical type of crane to use in any particular case without having full information as to the type of load handled, the average number of loads per day and the average longitudinal distance traveled. But if first cost is the main consideration the following assumptions and figures, when corrected to suit local conditions, can be used as a guide.

Speed of Cranes

The safe maximum speed of 100-ft. span gantry crane would be about 200 ft. per min. and should not exceed 250 ft., while the standard speed for an overhead crane of the same span is about 400 to 450 ft. per min. The wheel load of a 10-ton overhead crane, 100 ft. span, is about 34,000 lb. The wheel load of a gantry crane of like span is about 45,000 lb. The approximate price of two overhead cranes erected is $17,000, while the approximate price of two gantry cranes is $33,000.

The bay for an overhead traveling crane runway of 20 ft. span, to give good clearance for a railroad car, should be about 25 ft. high. Using A-frames for supporting the runway beams the estimated amount of steel required is 300 tons. At $140 a ton erected, the estimated cost of the installation of two overhead traveling cranes is as follows:

Cranes erected	$17,000
Runway erected	42,000
Runway piers	14,640
Total	$73,640

It is assumed that the concrete would cost $20 a cu.yd. and the bearing pressure be 4 tons a sq.ft. Six cu.yd. per pier gives $120 per pier and 122 piers at $120 each equals $14,640. The runway is 1,200 ft. long, of which 1,175 ft. is available for longitudinal travel, and with a runway of 100 ft. span, 95 ft. would be available for cross travel.

Therefore $\frac{73{,}640 \times 9}{1{,}175 \times 95} = \$5.92$ per sq.yd. as the cost of installation using overhead cranes.

The cost of an installation using two gantry cranes is about as follows:

2 gantries erected	$33,000
Concrete, 2,500 yd. at $20 per cu.yd.	50,000
Rail, in place, 2,400 ft., 100 lb. at 7c.	2,800
Total	$85,000

Total length of runway 1,200 ft. of which 1,150 ft. is available; span of crane 100 ft. of which 90 ft. is available. Therefore, $\frac{85{,}000 \times 9}{1{,}150 \times 90} = \$7.35$ per sq.yd., approximate cost of installation using gantry cranes.

The above figures are, of course, only approximate although the crane prices are taken from recent quotations. The price for the concrete is an arbitrary figure. The weight of the runway steel is about what would be used on a highly competitive job, with no purchaser's specifications. The crane prices are for standard cranes made to the manufacturer's standards. However, these prices would probably vary about the same under other specifications.

Overhead vs. Gantry

The writer believes that the overhead crane would probably do about twice as much work as the gantry, the upkeep would be about a third less, and there would be no trouble keeping the runway rails clear.

The reason so much concrete is figured for the gantry crane runway is that a section of concrete has to be used continuously under the rail sufficiently strong to support a wheel load of 45,000 lb. plus the dead load. The overhead crane, however, uses a pier every 20 ft., large enough to support a wheel load of 34,000 lb. plus the dead load. The gantry cranes in all probability would have to have piers as well on vhich the concrete beams would be supported and it would also need a timber say 8x12 in. to fasten the rail to.

Equipping an Ideal Automobile Shop—Discussion

By A. L. DeLeeuw

P. A. Fredericks' dream, as told on page 128, Vol. 60 of the *American Machinist*, is an improvement on mine but I feel that one improvement deserves another. His general design of the automatic automobile-making machine is *pretty* good, but it lacks one thing of which an older man than Mr. F. would naturally have thought.

There is a possibility that something may go wrong in the machine, and that the resulting automobiles may have the steering gear at the rear or the wheels at the top. This would cause a serious loss. Now if Mr. F.'s machine were only reversible we could run the product back the other way and get perfectly good pig iron at the head end of the machine. No loss, except some time and a little power. May I offer this as a suggestion?

[Perhaps this offers a real solution of the used car problem.—Ed.]

Where Machine Tools Are Made

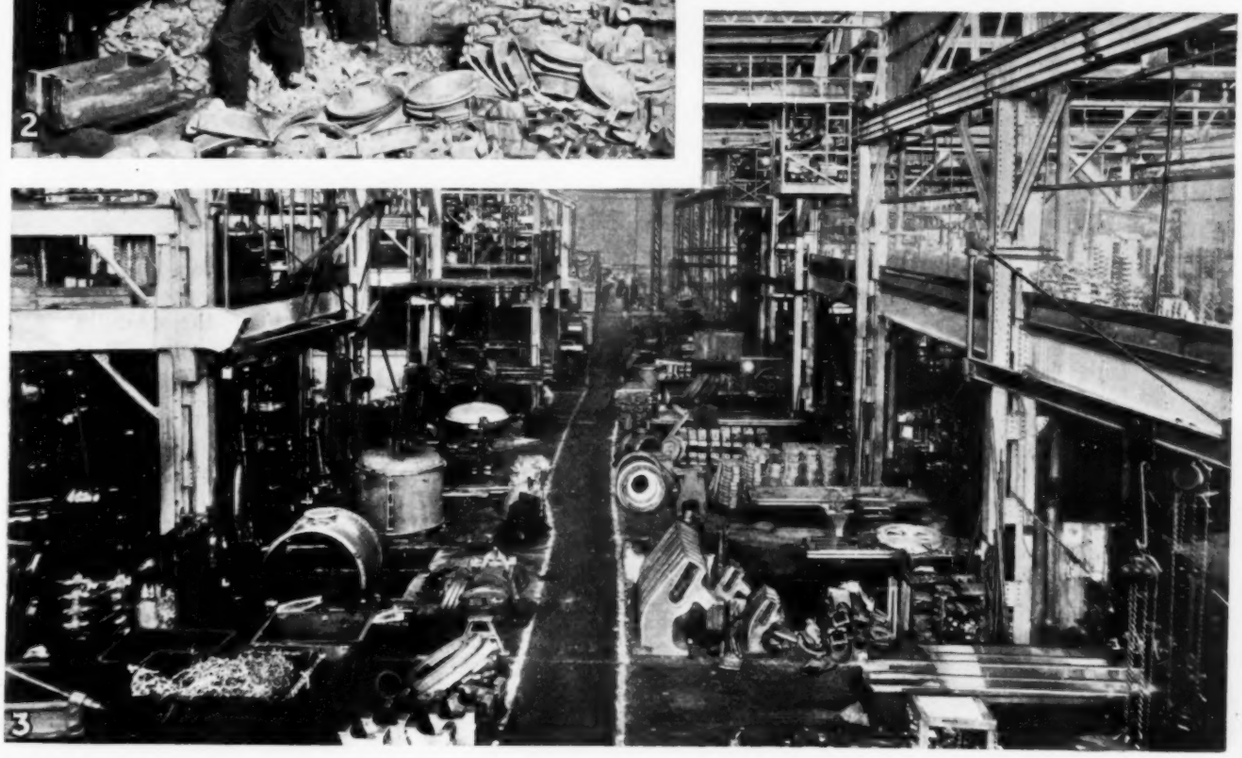
Buffalo Forge Company

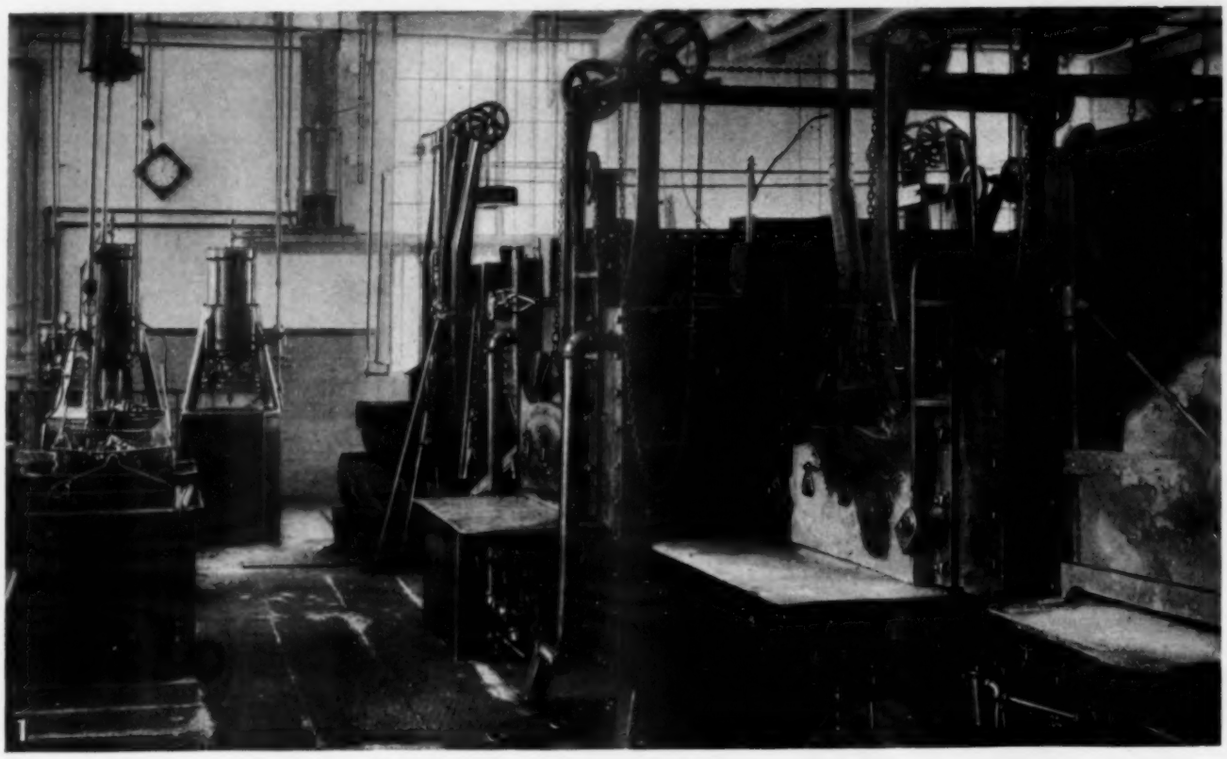
Founded 1877

Fig. 1—Bird's-eye view of Buffalo Plant

Fig. 2—Part of machine shop

Fig. 3—Looking down causeway of Buffalo plant





Heat-Treating Automatically

Equipment of the Gleason Works, Rochester, N. Y.

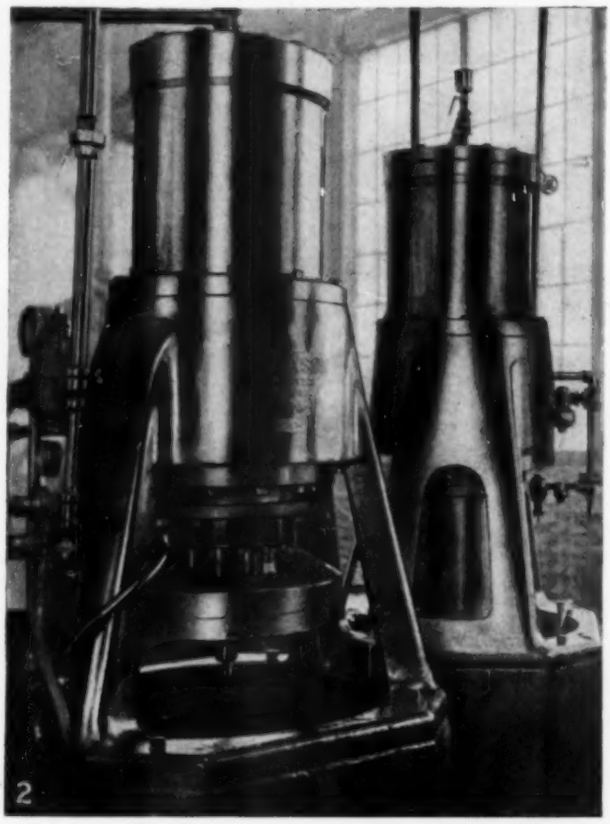


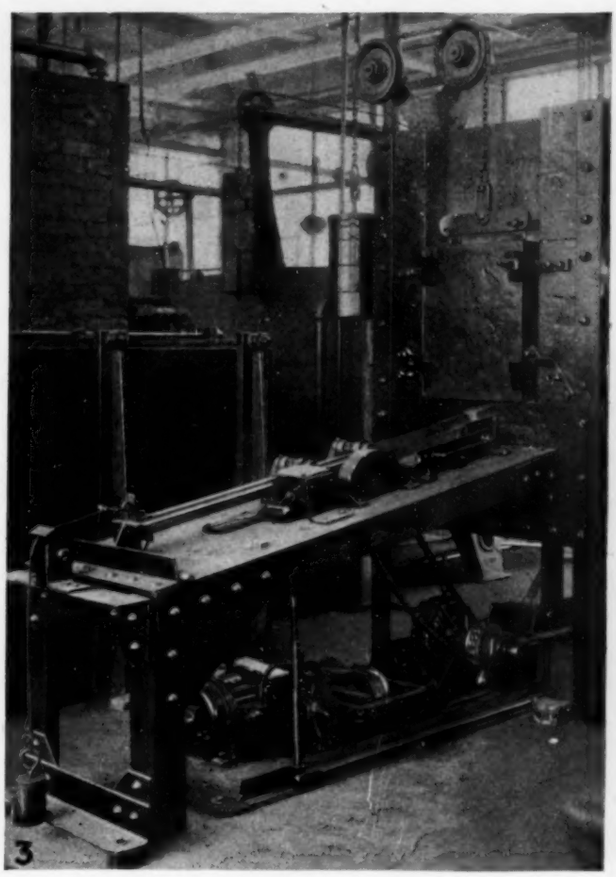
Fig. 1—General view of the heat-treating department.

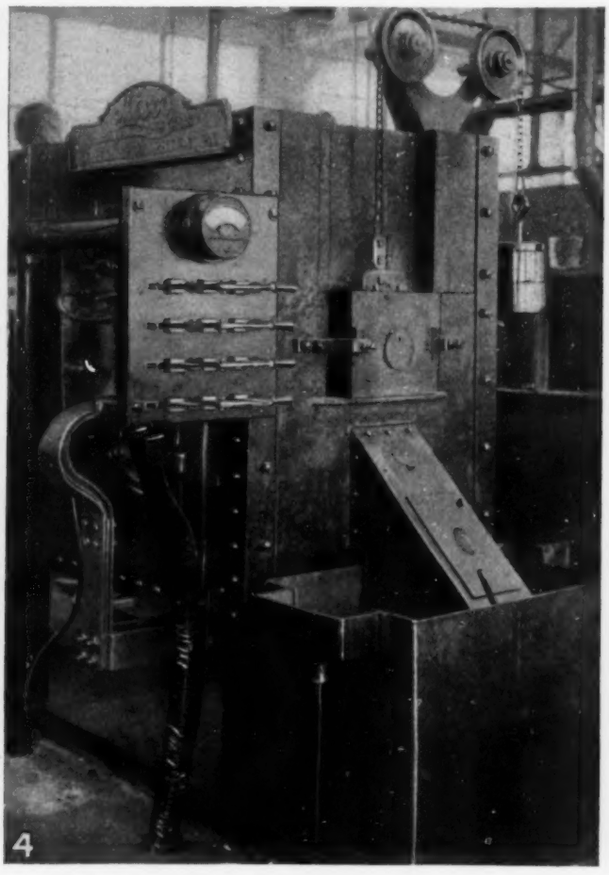
Fig. 2—Gleason 15-in. Quenching Press, adapted to bevel gears. It can be used on spur gears, internal gears or other work which has a tendency to warp.

The gear is held in a die while being quenched, both upper and lower die plates being cored out and provided with grooves to allow free passage of the oil, which is under forced circulation.

The working parts are actuated by air pressure, and a predetermined pressure is maintained on all parts of the gear by means of proper valves. The capacity of the machine is from 15 to 60 gears per hour.

A compressor supplying from 15 to 20 cu.ft. of free air per minute, with a storage tank of 20 cu.ft. capacity, is used with this machine. An air pressure of 60 lb. at the machine will answer for hardening gears of light section; a pressure of 80 to 90 lb. is required for gears of heavier section. The size of storage tank is determined by the inlet oil temperature desired, and whether or not artificial cooling is used.





Heat-Treating Automatically

(Continued)

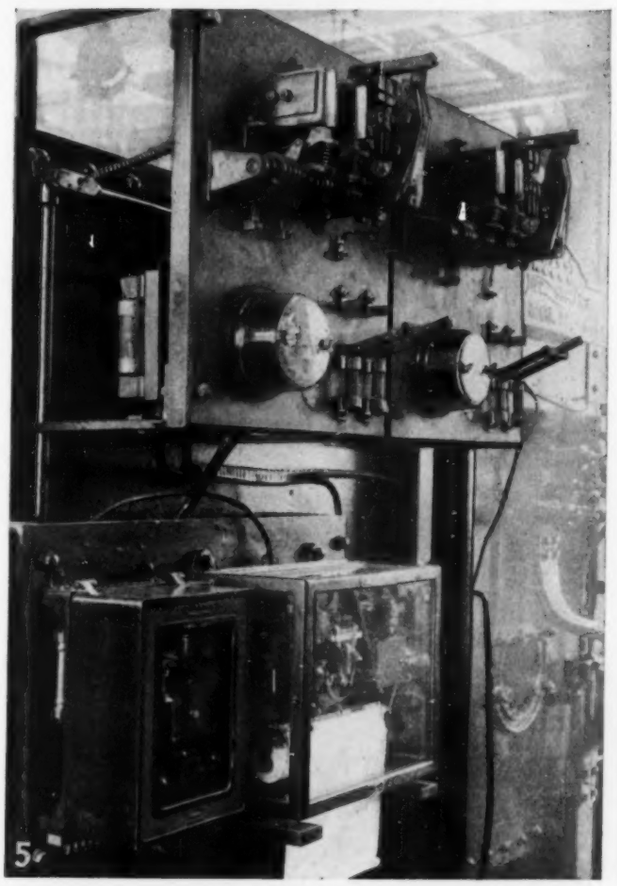
Fig. 3—Loading end of Electric High-Speed Steel Furnace built by F. J. Ryan & Co., Philadelphia, Pa.

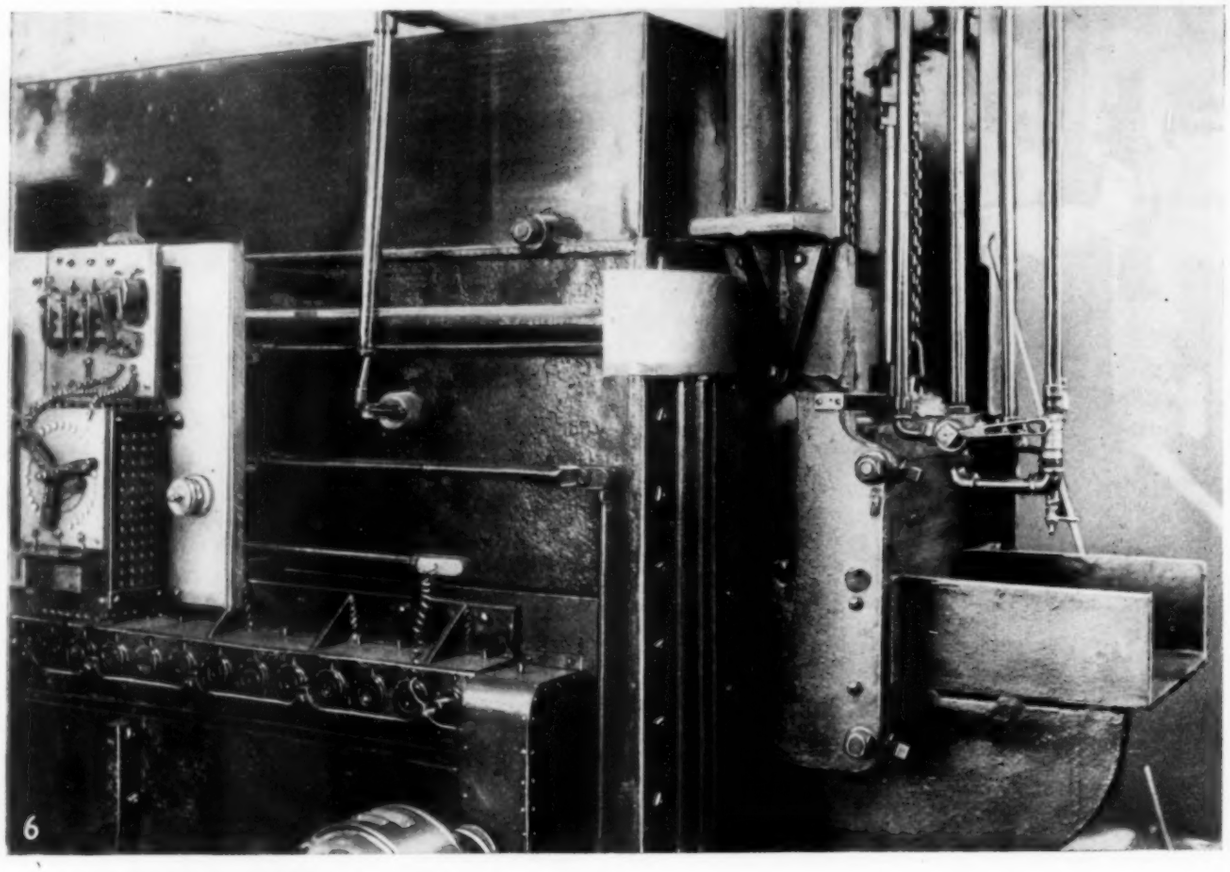
Fig. 4—Discharge end of same furnace.

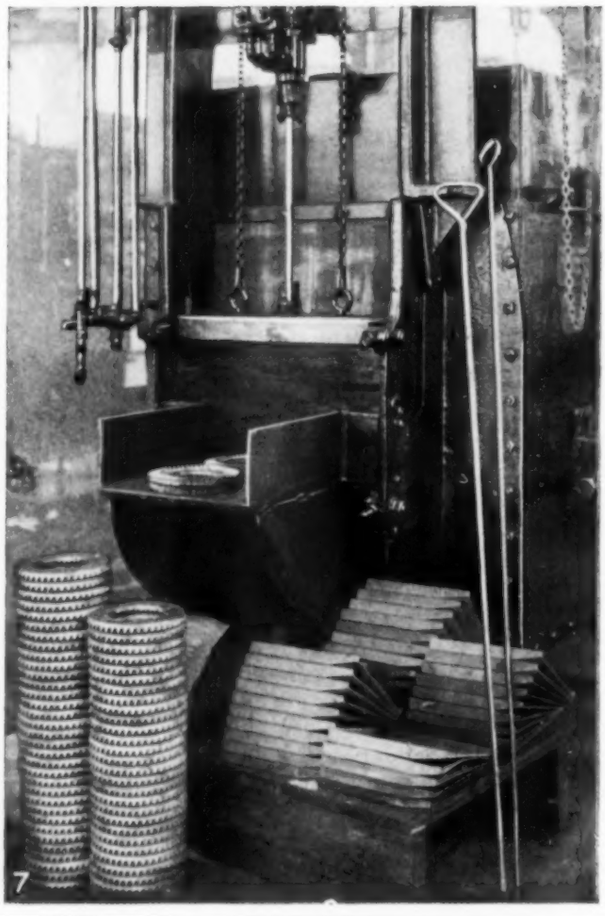
Fig. 5—Electric switchboard used with the furnace.

The preheating chamber is heated to 1,550 deg. F. by means of a nichrome ribbon resistor and the control of heat regulation is automatic. The high-heat chamber is heated to 2,360 deg. F. by a graphite resistor 3 in. in diameter by 24 in. long and the temperature control is automatic, through a recording pyrometer. With an electrical input of 50 kw., 200 lb. of high-speed steel per hour can be heated.

Work is discharged through a slot in the bottom of the high-heat chamber directly into the oil. The speed of the conveyor is arranged to give the tools from 2 to 6 minutes in the high-heat chamber. There is a variable speed control for the pushers.







Heat-Treating Automatically

(Continued)

Fig. 6—Side and discharge end of Gleason Reheating Furnace for Bevel Gears and other work.

Fig. 7—Charge end of same furnace.

In this furnace the work is entered at one end and removed from the other. Heating elements are of the ribbon type, set along the sides of the tunnel which is 17 in. wide and 11 ft. long. Doors are operated by compressed air. About 10 lb. of metal are heated for each kilowatt of energy used. A Leeds & Northrup Potentiometer controls the current and the heat is held to ± 5 deg. F.

The work moves through the furnace on rollers of heat-resisting alloy, revolved by worm wheels on their ends (outside the furnace), driven by a single long worm. Thus no portion of the conveying mechanism changes its location or is chilled by contact with the air.

Modern Practice in Fitting Studs

Special Correspondence

A résumé of the methods used in securing satisfactory fits for studs in aluminum, bronze, cast iron, and steel—Tap drills, "lute," and thread fits

THE making of studs and the fitting of them into the work, involves more problems than those who do not use them realize. The National Screw Thread Commission has made a careful study of this phase of screw-thread fits and has secured data of value to all users of studs. A portion of this information is given herewith, both to aid users of studs in various lines and to secure criticisms and suggestions which will make the data of even greater value. The information is compiled from the practice of forty firms, representing both automobile practice and that of builders of heavy steam engines, mining machinery and the like.

Stud material varies from bar iron in one case to heat-treated alloy steel in some others. In some cases the nut end is threaded in a die but with the fixed end specially cut in some way, either by using a die set large, or by milling or chasing. A few users buy studs with only the nut-end threaded and then cut the fixed end to suit.

Methods of driving studs vary from hand wrenches to special air- or electric-driven devices. Upright and radial drills are also used at times, usually with a friction device between the power spindle and the stud.

The torque required is the most important factor in driving studs, although few make any attempt to measure it. One concern which made dynamometer tests, found that with varying minor diameters the threads of soft-steel studs flow appreciably, and that an increase in minor diameter of the tapped hole allowed room for this flow. Studs screwed into aluminum require much less torque than for cast iron, even though the interference at the pitch diameter is greater.

Percentage of Thread Depth

Experiments as to the depth of thread (not depth of hole) show that the hole before tapping can be much larger than is generally supposed and still hold the stud against stripping, even in aluminum. Table I shows that a 43 per cent depth of thread in aluminum will break a ⅜-in. stud before stripping, when the stud is a good fit, or in other words has an interference of metal of 0.003 inch.

The depth of the hole also has its effect, but a depth of 1½ diameters is sufficient for most materials, unless the stud has to carry an appreciable fatigue stress. In that case 2 diameters will be better.

The "lute" or material used on the threads in setting studs also affects the torque. White lead is frequently used with iron or steel, and oil with aluminum. One motor builder uses kerosene in the latter case.

There is a growing tendency to use ground taps in some cases for stud holes which are held to very close limits. A ground tap will have less lead errors than a commercial tap and consequently the lead of the tapped hole will be more nearly correct. A few manufacturers state that they use studs that are cut with dies having ground chasers, giving studs with less lead errors. With minimum lead errors in both the tapped hole and stud-thread, the greatest area of surface in contact will be

Table I—Tests of Stud Holes with Different Depths of Threads

Pitch Dia. Stud, In.	Pitch Dia. Hole, In.	Pitch Dia. Interference, In.	Minor Dia. Hole, In.	Percentage Depth of Thread	Material	Elastic Limit, Lb.	Maximum Stress, Lb.	Remarks
			—⅜ x 18 Studs—					
0.282	0.278	0.004	0.257	75	Cast Iron	3,800	6,000	Stud broke
0.2775	0.278	.....	0.257	75	Cast Iron	3,850	6,450	Stud broke
0.282	0.278	0.004	0.2656	65	Cast Iron	3,950	6,025	Stud broke
0.2775	0.278	.....	0.2656	65	Cast Iron	2,325	5,525	Stud broke
0.2775	0.278	.....	0.272	56	Cast Iron	3,750	6,600	Stud broke
0.2775	0.278	.....	0.277	49	Cast Iron	3,500	5,950	Stud broke
0.2775	0.278	.....	0.2812	43	Cast Iron	2,700	5,700	Stud broke
0.2815	0.278	0.0035	0.2812	43	Aluminum	2,800	5,850	Stud broke
0.281	0.278	0.003	0.2812	43	Aluminum	2,400	5,850	Stud broke
0.278	0.278	.....	0.2812	43	Aluminum	3,200	5,450	Stud broke
			—¼ x 14 Studs—					
0.3937	0.3927	0.001	0.397	43	Aluminum	6,150	9,400	Stud broke
0.3937	0.3927	0.001	0.397	43	Aluminum	7,500	10,000	Stud broke
			—½ x 13 Studs—					
0.453	0.453	.....	0.4531	47	Cast Iron	....	16,750	Stud broke
			—½ x 20 Studs—					
0.4691	0.4691	.....	0.4531	72	Mall. Iron	....	17,410	Stud broke
0.4691	0.4691	.....	0.475	39	Mall. Iron	....	17,925	Stud broke
0.4685	0.468	0.0005	0.475	39	Mall. Iron	....	17,000	Threads stripped in hole due to bad material

obtained. This means a better holding stud. Some users rough tap with a commercial tap and finish with a ground tap to insure uniform diameter. For cast iron some advocate a four fluted tap with narrow lands and a three fluted tap with wider lands for steel and aluminum. Some rough tap by machine and leave 0.010 in. for a hand-finishing tap. Holes are tapped straight in almost every case but one builder of large machinery uses a taper of ½ in. per foot.

The chamfering of the end of studs is also a part of the discussion. One user gives as his experience that a chamfer of 90 deg. included angle throws up a burr on the first thread, which makes a stud drive hard but allows it to unscrew easily. He prefers the 60 deg. included angle. In Table II his practice in chamfering is given.

There is considerable variation in practice as to the fit of the fixed end of the stud in different materials. The same size is generally used for both cast iron and steel. For aluminum, however, the stud is usually made larger. One of the largest automobile builders for

example adds 0.002 in. to the pitch diameter for cast iron, steel brass and bronze, while for aluminum 0.004 in. is added. The tapped hole is the same in all cases.

Another automobile concern uses S.A.E. or fine pitch threads for studs in steel, rolled or cast brass and iron

Table II—Chamfer Diameter at Stud Ends

Coarse Threads			Fine Threads		
Nominal Size	Threads per Inch	Chamfer Diameter, Inches	Nominal Size	Threads per Inch	Chamfer Diameter, Inches
1/4	20	11/64	1/4	28	3/16
5/16	18	7/32	5/16	24	13/64
3/8	16	9/32	3/8	24	15/64
7/16	14	31/128	7/16	20	19/64
1/2	13	9/32	1/2	20	23/64
9/16	12	7/16	9/16	18	13/32
5/8	11	31/64	5/8	18	15/32
			11/16	16	17/32
3/4	10	19/32	3/4	16	21/32
7/8	9	11/16	7/8	14	25/32
1	8	13/16	1	14	29/32
1 1/8	7	59/64	1 1/8	12	1
1 1/4	7	1 3/64	1 1/4	12	1 1/8
1 1/2	6	1 11/64	1 1/2	12	1 1/4

and steel castings. But for studs, cap screws or tap bolts screwed into aluminum, it uses U. S. or coarse pitches. The S.A.E. thread is used on the nut end of all studs. This concern uses the sizes shown in Table III for the fixed ends of studs.

One large engine builder makes studs from 0.007 to 0.010 in. oversize for sizes under 2 in. and 0.015 in. oversize for studs over 2 in. Table IV gives the sizes used by a large builder of automobiles and trucks.

The National Screw Thread Commission has compiled several tables showing the practice of the forty firms previously mentioned. The Commission has also averaged the allowances given in these tables, but recognizes that

Table III—Large Automobile Builder's Stud Fits

Size	Stud Fit in Steel Mean P.D. of Stud	Stud Fit in Aluminum Mean P.D. of Stud
Up to 1/2 inch	Mean P.D. of Tap plus 0.002 in.	plus 0.004 in.
1/2 to and including 1 inch	Mean P.D. of Tap plus 0.003 in.	plus 0.005 in.
From 1 inch up	Mean P.D. of Tap plus 0.004 in.	plus 0.006 in.

an average may not represent the best practice in any particular care, unless the volume of work covered, as well as the quality of the product is considered. So instead of reproducing these tables it seems best to show the practice of one of the largest automobile builders and the recommendations of two other firms. Table IV deals with the coarse, or U. S. pitches, while Table V is for fine, or S.A.E. threads.

Having the practice of the large firms mentioned as a guide, the average user cannot go wrong.

Table IV—Pitch Diameters for Stud Fits—Coarse

			General Motors Corporation				Chicago Screw Company				Greenfield Tap and Die Corporation (Proposed)		
			Studs permanently set in cast iron, steel, and bronze		Studs permanently set in aluminum		Studs set in heavy sections, as in steam pumps and engines		Studs set in tight sections, gas engine standard				
Sizes	Threads per Inch	Basic Pitch Diameter, Inches	Min. Limit, Inches	Tolerance, Inches	Min. Limit, Inches	Tolerance, Inches	Min. Limit, Inches	Tolerance, Inches	Min. Limit, Inches	Tolerance Inches	Min. Limit, Inches	Tolerance, Inches	Tolerance on Hole, Inches
1/4	20	0.2175	+0.003	+0.002	+0.005	+0.002	+0.002	+0.0015	+0.0011	+0.0015	+0.0020	+0.0024	+0.0036
5/16	18	0.2764	+0.003	+0.002	+0.005	+0.002	+0.0025	+0.0015	+0.0011	+0.0015	+0.0020	+0.0025	+0.0037
3/8	16	0.3344	+0.003	+0.002	+0.005	+0.002	+0.003	+0.0015	+0.0015	+0.0015	+0.0020	+0.0026	+0.0038
7/16	14	0.3911	+0.003	+0.002	+0.005	+0.002	+0.0035	+0.0015	+0.0020	+0.0015	+0.0021	+0.0026	+0.0039
1/2	13	0.4500	+0.003	+0.002	+0.005	+0.002	+0.004	+0.0015	+0.0020	+0.0015	+0.0021	+0.0027	+0.0040
9/16	12	0.5084	+0.003	+0.003	+0.005	+0.003	+0.004	+0.002	+0.0025	+0.0020	+0.0021	+0.0028	+0.0040
5/8	11	0.5660	+0.003	+0.003	+0.005	+0.003	+0.004	+0.002	+0.0026	+0.0019	+0.0021	+0.0030	+0.0041
3/4	10	0.6850	+0.003	+0.003	+0.005	+0.003	+0.0045	+0.002	+0.0026	+0.0020	+0.0022	+0.0030	+0.0043
7/8	9	0.8028	+0.003	+0.003	+0.005	+0.003	+0.0055	+0.002	+0.0031	+0.0020	+0.0022	+0.0032	+0.0044
1	8	0.9188	+0.003	+0.003	+0.005	+0.003	+0.0055	+0.002	+0.0035	+0.0020	+0.0023	+0.0034	+0.0046
1 1/8	7	1.0322	.....	.....	.....	.....	+0.006	+0.002	.....	.....	+0.0024	+0.0035	+0.0048
1 1/4	7	1.1572	.....	.....	.....	.....	+0.006	+0.0025	.....	.....	+0.0024	+0.0036	+0.0050
1 1/2	6	1.3917	.....	.....	.....	.....	+0.006	+0.003	.....	.....	.....	.....	.....
1 3/4	5	1.6201	.....	.....	.....	.....	+0.0065	+0.0035	.....	.....	.....	.....	.....

Table V—Pitch Diameters for Stud Fits—Fine

			S. A. E. Proposed Practice						Chicago Screw Co. Studs for light sections*		Greenfield Tap and Die Corporation (Proposed)		
			Stud set in steel		Stud set in cast iron		Stud set in aluminum						
Sizes	Threads per Inch	Basic Pitch Diameter, Inches	Min. Limit, Inches	Tolerance, Inches	Min. Limit, Inches	Tolerance, Inches	Min. Limit, Inches	Tolerance, Inches	Min. Limit, Inches	Tolerance, Inches	Min. Limit, Inches	Tolerance, Inches	Tolerance on Hole, Inches
1/4	28	0.2268	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0010	+0.0015	+0.0019	+0.0022	+0.0034
5/16	24	0.2854	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0010	+0.0015	+0.0019	+0.0024	+0.0035
3/8	24	0.3479	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0015	+0.0015	+0.0019	+0.0024	+0.0035
7/16	20	0.4050	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0021	+0.0015	+0.0020	+0.0025	+0.0036
1/2	20	0.4675	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0021	+0.0015	+0.0021	+0.0024	+0.0038
9/16	18	0.5264	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0025	+0.0020	+0.0019	+0.0027	+0.0038
5/8	18	0.5889	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0026	+0.0020	+0.0019	+0.0028	+0.0038
3/4	16	0.7094	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0025	+0.0020	+0.0019	+0.0029	+0.0040
7/8	14	0.8286	+0.000	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0030	+0.0020	+0.0018	+0.0031	+0.0042
1	14	0.9536	+0.001	+0.003	+0.002	+0.003	+0.004	+0.003	+0.0035	+0.0020	+0.0018	+0.0032	+0.0043
1 1/8	12	1.0709	+0.001	+0.003	+0.003	+0.003	+0.005	+0.003	.....	.....	.....	.....	.....
1 1/4	12	1.1959	+0.001	+0.003	+0.003	+0.003	+0.005	+0.003	.....	.....	+0.0017	+0.0034	+0.0045
1 1/2	12	1.4459	+0.001	+0.003	+0.003	+0.003	+0.005	+0.003	.....	.....	.....	.....	.....

* Recommended only where careful selection is given to taps.

Note: "Min. limit" indicates the amount by which the minmum screw is above basic size.

Test Methods for the Shop

By Donald A. Hampson

Usual shop tests — Use of revolution counter, spring balance, platform scale and Bourdon gage — Accuracy required — Checking instruments

SHOP tests may have as their object the determination of a strength factor or a power loss, a guide as to shop practice or the continuation of a new line of work, demonstration of a disputed point or of doubted results before a prospective customer, or the securing of data for the engineering department.

Plants that are big enough to maintain an engineering laboratory conduct tests in the laboratory as far as possible and, in any case, have a staff trained in such work, but in smaller plants, tests must be carried out directly in the shop or in the field, and must be made by such members of the office and shop forces as are qualified and needed to assist. Frequently such tests must be made without a chance for extensive preparation.

Simple Instruments Required

Aside from connection pieces and rigging, a majority of the tests which concern a machine shop may be conducted if there is available a small assortment of instruments. These are a revolution counter, a spring balance, a platform scale and a Bourdon gage. One or more of these are sufficient to conduct the majority of everyday shop tests, and modifications or special types of these instruments are highly desirable for more extensive testing.

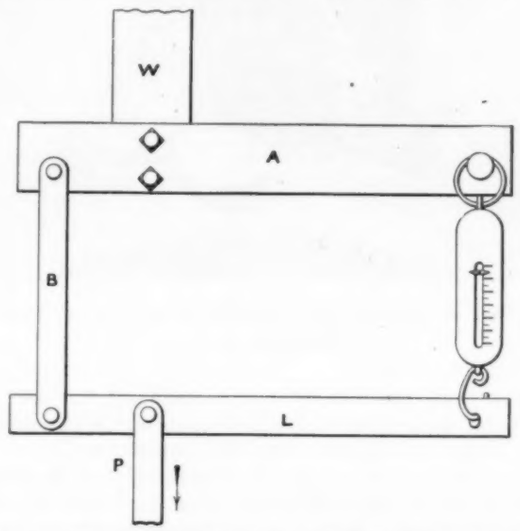


Fig. 1—Measuring a force greater than capacity of a spring balance

Revolution counters are found in the tool kits of all machinists doing maintenance work. These are usually of the worm-and-gear type and very often are in too poor shape to be used for anything but millwright work. A high-grade revolution counter can be bought for less than five dollars and one should be in every tool room. It is better to buy an instrument that is direct reading than one which requires counting the turns of a revolving button.

For "pull" loads of moderate degree, the commercial spring balance is widely used. Any instrument of this kind, made by a reputable house, is sufficiently accurate for ordinary tests though, quite naturally, a balance of large capacity will not give the same accuracy on small loads as will one of smaller capacity. Thus, a balance that reads to 800 lb. will show a 150-lb. load, but not to the same degree of accuracy as a 200-lb. balance. Likewise, the readings on heavy loads are not as close as on light loads when using a balance of proportionate capacity, because the graduations are of necessity fewer, with bigger increments. In laboratory terms, the "least count" of the instrument is greater. When buying for test purposes alone, the balances now made with a round dial are to be preferred.

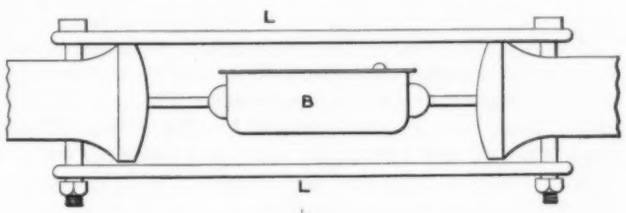


Fig. 2—Spring balance arranged to measure drawbar pull

Measuring a Heavy Load Greater than the Capacity of the Balance

A case often encountered is illustrated in Fig. 1, in which the balance has a capacity much less than the load to be tested. Here *W* is the connection piece on the machine, to be tested in the direction of the arrow at *P* and the only instrument available has insufficient range. A bar *A* is bolted to *W* and a parallel bar *L* is spaced at a convenient distance by means of the link *B* and the spring balance, which are placed at opposite ends, the balance being located at the long ends of the levers. When the pull is applied at *P*, *B* takes the greater part of the load directly but the total load may be calculated, in terms of simple leverage, from that portion which is read on the dial of the spring balance.

A case somewhat similar is shown in Fig. 2. Here

the resistance of several special railroad cars was desired, both to compare the merits of two classes of bearings and to compare the actual resistance with the theoretical. The spring balance used was of much larger capacity than any starting resistance but it was not proof against the destructive effects caused by sudden jerky starts. Instead of coupling pins, bolts

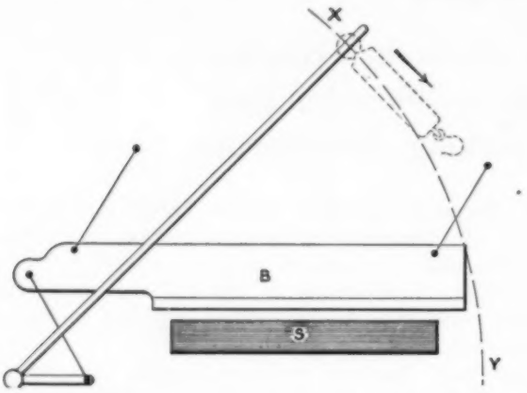


Fig. 3—Testing paper cutter with spring balance

that fitted the holes in the draw heads were used, and the spring balance *B* was fastened between these by special connections in the drawheads. Then, above and below, the loops *L* were caught by the bolts. These loops were forged from ¾-in. bars and made of such a length that the bolts met the ends of the loops before the spring was fully extended.

Another application of the balance is shown by the skeleton diagram in Fig. 3. The guillotine knife blade *B* is caused to cut the pile of paper *S* when power is applied to the handle and transmitted through suitable connections. This is the familiar hand-operated paper cutting machine and has a parallel in a wide variety of shearing machines.

Paper Cutter Test Requirements

The resistance of different classes of paper stock and the power required at different cutting angles and with varying degrees of blade grinding is frequently required. The results are hard to obtain theoretically because of the variation of "paper friction" as the blade descends.

In designing a power cutting machine for regular or special service, the total of machine and paper friction must be known, together with the resistance of the paper to cutting, and this is best found by tests upon a hand cutter. There is very little gained from the momentum of moving parts, so the hand machine provides reliable data which may be obtained from a movement so slow as to be easily read. Calculations based upon the reading at the critical point may then be worked out in designing a flywheel for the power machine. The line *XY* in Fig. 3 is the arc traveled by the hand in working the machine. On this line, the spring balance must be positioned and it must be so controlled that its angle to the handle at the point of application is kept the same throughout.

A similar method has been used on arbor presses and presses of the bench type that are used for assembling small parts, when data were desired to correlate the stresses, fits, and pressure to be applied.

When the pressure of liquids or gases is to be determined, the ordinary round face Bourdon gage is the most convenient instrument to use. Within reasonable limits of pressure, these gages are inexpensive. Most shops have a number of such gages on hand, and it is necessary only to have the hand work freely and calibrated by some simple test, to make them available for ordinary tests.

Special Graduations for Gages

There are instances in which the same constant appears in all the calculations based upon gage readings, so that a dial that is graduated to read in some unit other than pounds per sq.in. will give the desired result at a glance. For instance, a gage reading may show the pressure of a liquid passing through a pipe, this pressure then being used in a formula to get the discharge in gallons or cubic feet per minute. It is possible to make the gage direct-reading for continual use under similar conditions by adding a second set of figures to the dial, which will then show the calculated results for pressures within range of the gage. In this way, it is possible to save a good deal of repetition in desk work, to supply a gage that is direct-reading in any desired terms, and that can be used by shop men as well as engineers.

To show how simple a matter it is to get exact readings and known results instead of guesswork, the test shown in Fig. 4 is illustrated. A gage was used to determine the actual pressure on the piston head instead of assuming that it was "four atmospheres." Ordinary

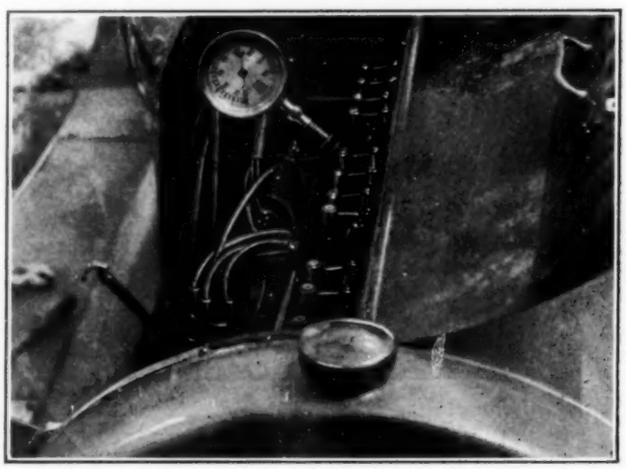


Fig. 4—Measuring cylinder pressure with a Bourdon gage

fittings that cost twenty cents made up the assembly ready for use, except the minor shop operation involved in chasing one thread to fit the spark plug hole.

Platform scales are an invaluable help in conducting tests as their field of application and adaptation is unusually wide. Any load or pressure which can be made to strike the platform is measured directly with accuracy varying only with the error of the instrument. Errors in a platform scale in good condition are practically self-evident and usually can be corrected by a simple adjustment.

When the force to be measured is directed up instead of down, some means of confining it so that the reaction may strike the platform in the normal way must be provided, and clamps or yokes that attach to the scale bed are frequently employed.

Within its limitations, the method shown in Fig. 5

is excellent. A device which might be classed as a special form of screw jack is to be tested, and as may be noted, the scale is run under the bed of a planer. The base *J* is placed upon a spacing block laid on the platform. The lever *L* operates the screw and the swivel plate *A* contacts with the under side of the bed. Several points are to be determined by the tests: the length of lever *L* to exert a given thrust when a known pull, measured by a spring balance, is applied; the pull that will bend the lever; the thrust exerted when a given pull is applied to the lever; and the decrease in pull required for a given thrust when anti-friction bearings are substituted for the plain surfaces between the screw head and the plate *A*.

It is possible to calculate these several results in

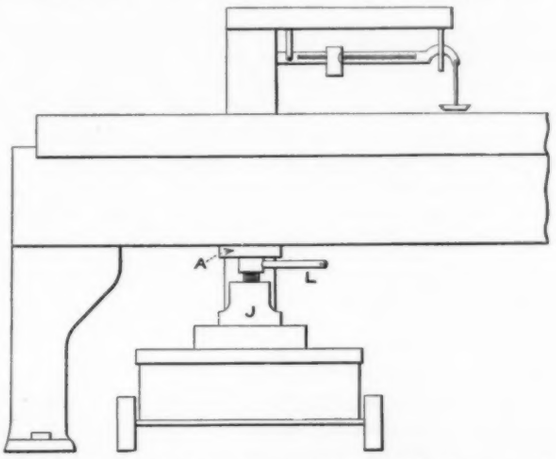


Fig. 5—Upward thrust measured on platform scale

advance, basing the calculation upon theory and assumed factors of friction, but the tests outlined will show conclusively, and at nominal expense, just what the actual results are. This arrangement is one of the simplest and a variety of others utilizing other machine tools will no doubt occur to the reader.

A different form of scale test is illustrated in Fig. 6. This arrangement was used in a plant that had available a scale whose platform was level with the wood floor, and the purpose of the test was to determine the force available for automotive braking.

Bearing in mind that the line *X-X* represents both the floor plane and the platform of the scale, it is readily apparent how muscular force is determined in pounds. The pedal shaft bearings are screwed to the floor and carry the shaft on which are the foot pedal and an arm *A* of a length equal to the brake-arm. The arm *A* bears on the block *B* resting on the scale platform. The seat is attached to the floor and is adjustable in two directions.

Tests of this sort are most enlightening to those who would use human power on simple operations. On punch presses of the "kick" variety, brakes and treadles, the leg muscles are called upon throughout a long work day and, since they tire hour by hour, the most comfortable position, where the most force may be exerted without straining to the fatigue point, is highly important. No mere judging from a test person's "feel" can be relied upon. The same is true of the power of hand motions and the relation of different positions.

When operatives are seated, their weight is not available for useful work. It has been found by means of tests as described that 50 lb. is nearly the limit of leg power when seated, with an all-day value much less than this. Because of the leg position when seated, the downward force is limited in power and range. If exerted on an angle of 45 deg., the leg pushes more readily and throughout a greater distance, advantage

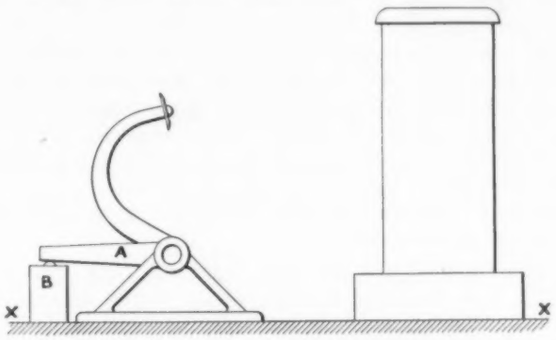


Fig. 6—Apparatus for testing foot power

of which is taken in the construction of kick presses, on some of which it is possible for girls to do heavy stamping.

The conventional method of measuring the power in a revolving shaft is to use a dynamometer and the simplest form of this latter is the absorption dynamometer known as a "Prony brake." Stripped of refinements, this may be two blocks of wood clamped to the shaft, or to a wheel on the shaft, and having an arm fastened to one of them which bears upon a scale platform or extends a spring balance. Such a Prony brake fulfills the requirements of many tests, but where speeds are high and a considerable amount of power is absorbed by the brake, the blocks will heat and burn. A more elaborate form of brake must then be used and provision made for circulating cooling water.

In Fig. 7 is shown a Prony brake that has much to commend it. A cost low enough to permit its construc-

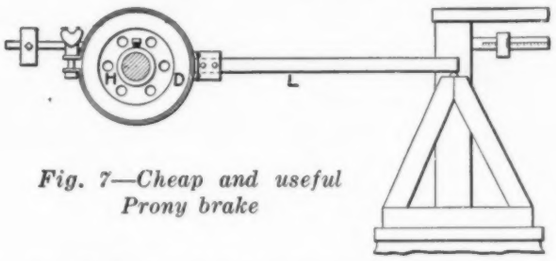


Fig. 7—Cheap and useful Prony brake

tion for just one test, readily obtained parts, and reasonable freedom from heating are some of its features. An automobile hub *H* is attached to the revolving shaft and carries with it the drum *D*, also an auto part. The brake band and nut are parts of the automobile braking system and are used without alteration. A piece of angle riveted to the brake band has an arm *L* fastened to it, the end of the arm resting on the pivot which transmits the force delivered to the scale platform. An arm to the left of the shaft carries a poise that is adjusted to balance the dead weight on the right-hand side. This method of balancing is more convenient than the customary laboratory tests for unbalanced weight, though not as accurate. When necessary, it is possible to water-cool the drum by the addition of simple sheet metal plates, though asbestos brake lining alone will stand all the heat generated in most tests.

Besides the tests outlined above, any number of others might be described, and with them many other recording and measuring instruments which would be required at the same time, but it is the purpose of this article to cover the elements of mechanical testing, not to invade the field of prime movers, electricity and hydraulics at any point other than where they concern the work of the shop. The more elaborate and special instruments required in the special lines are expensive and, though sometimes helpful, are not necessary for mechanical laboratory testing. There are times, however, where steam gage readings, volt and ammeter readings, and the charts of a Venturi can be of distinct assistance and when they are already installed, they relieve the tester of getting equivalent data in another way.

The value of any test lies in its accuracy, but "accuracy" is a decidedly variable term. From an engineering standpoint, absolute accuracy is neither necessary nor desirable and even "commercial accuracy" is slow and expensive to obtain. It is not the purpose here to encourage laxity but there is little excuse in striving for results to four decimal places when one is sufficiently close. Common sense should dictate the necessary degree of accuracy.

In making tests, there are personal and accidental errors that affect the results and there are errors in the instruments. The greatest aid to accuracy is repetition. By repeated tests and readings, the personal and accidental errors will, in all probability, balance for the tendency of observers to read high as well as low is well proven. Errors in the instruments may be corrected in advance or allowance can be made for them.

The instruments must be checked by some known standard, or in the case of most shop tests, by comparison with another instrument that is known to be correct within one-quarter to one-half its least count.

Revolution counters may be checked by comparison with tachometers, and vice versa, making the check at the same time to avoid variations. Pressure gages are best tested by the dead weight method. This requires special apparatus, but where there is a locomotive shop in the vicinity, one can usually get such tests made. If there is a steam or air line in the shop that has gages which are occasionally tested, a comparison made by tapping into this line will be sufficiently close. If the finger reads zero at the start and stands with the other gage at line pressure, the purposes of the ordinary test will have been satisfied.

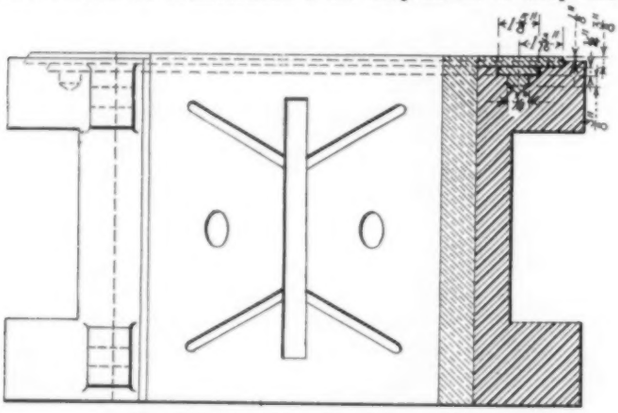
Platform scales and spring balances are very easy to check. What error there may be in these instruments exists throughout the range at the same value. If it is known and cannot be corrected, it can be allowed for in the calculations.

Casting Crown Brasses and Hub Plates in Place—Discussion

BY C. L. DICKERT
Superintendent Motive Power, Central of Georgia Railway

I was very much interested in the article by Fred H. Colvin, appearing on page 479, Vol. 59, of the *American Machinist*, under the title given above.

We first face driving box and counterbore it, then dovetail on each side of counterbore. We spot drill in the bottom of counterbore ¼ in. deep so as to keep the



Details of driving-box wear plate

hub plate from turning. The double dovetail keeps the plate rigid and prevents it from falling out even if it becomes loose. The illustration shows our method of putting in the plate. When it becomes necessary to remove the plate the box has to be put back on the boring mill and the worn plate cut out. This method secures us the average mileage. The driving box is next put on the slotter and machined out for crown brass. The crown brass is machined to press in the box at the tonnage given in the accompanying table.

After the crown brass is pressed in the driving box it is then drilled for plugs. The plug holes are reamed from the inside making them taper so plugs cannot come out even if the box becomes loose. This insures the crown brass staying in position under all conditions.

The driving box is next sent to the furnace where the

Pressure to be Used in Pressing in Driving Box Brasses

Diameter of Fit in Inches	Tons — Material in Boxes — Steel	Hunt Spiller	Cast Iron
8 – 8½	24 to 25½	20 to 21½	16–17
8½– 9	25½ to 27	21½ to 22½	17–18
9 – 9½	27 to 28½	22½ to 23¾	18–19
9½–10	28½ to 30	23¾ to 25	19–20
10 –10½	30 to 31½	25 to 26¼	20–21
10½–11	31½ to 33	26¼ to 27½	21–22
11 –11½	33 to 34½	27½ to 28¾	22–23
11½–12	34½ to 36	28¾ to 30	23–24
12 –12½	36 to 37½	30 to 31¼	24–25
12½–13	37½ to 39	31¼ to 32½	25–26

brass hub plate is cast on. After casting the hub plate, the box is bored to suit the journal. The hub plate is also faced off to the proper thickness at the same setting. We allow the crown brass to extend high enough to be faced off with the hub plate.

Taking one of our 1,651 class engines into the shop for class 5 repairs after it has made an average of 70,000 miles, we find it necessary to renew the main crown brasses and take up lateral motion on all driving boxes. As a rule the front and back crown brasses can be put back again by tightening them up if loose, and sometimes, if the journal has to be turned, we can save the brass by recrowning it, if it is not worn too thin. In this class of repairs we find it necessary to make other repairs to locomotives such as turning tires, remetal crossheads, line down driving box wedges, renew side rod bushings and set valves. Repairs of this nature keep the locomotive in the shop 36 working hours.

Industrial Cost Accounting for Executives

By Paul M. Atkins

Article twenty-seven—Co-ordination of the cost records and the general accounts — Method of affecting the union of these accounts — Detailed analysis of various accounts

THE NECESSITY of the close co-ordination of the cost records with the general accounts was emphasized in the opening article of this series and the importance of their interrelationship is so great that it is appropriate to reiterate it here at the beginning of this article thereon. From some points of view the cost accounts are simply a part of the whole accounting system—a section which has been set up by itself for administrative convenience. From other points of view they are rather an extension of the production records, a fact which is easily understood when the constant use in the cost department of tickets and slips from the planning department is remembered. From either standpoint, however, the closeness of the connection is essential if both functions of the business which are represented by the two sets of accounts are to operate in the most effective and efficient manner.

WITHOUT the information which is only to be obtained from the cost records, it is impossible for the general accounts to attain the requisite completeness and accuracy which is so essential to their full value. Nor is this service an entirely one-sided proposition, for the general accounts furnish very material assistance to the cost records.

There is no question but what the interlocking of these sets of records is a prime essential to both, and of considerable importance to the business as a whole, for it should be remembered that if the cost records are interlocked with the general accounts, they are also tied in with the production records and hence form one of the significant binding elements of the control system of a business as a whole.

If it were not for the cost records the general accounts would lack data each month which are quite essential if they are to show a correct and complete record of the transactions—internal as well as external—of the business. Inventories of all kinds would be missing from the reports of the condition of any manufacturing company if some kind of costs had not been kept by the concern. It should always be remembered that if the records are not complete and are not accurate they lose a large part of their value for control purposes. Without the information which is only to be obtained from the cost records, one instance of which is given above, it is impossible for the general accounts to attain the requisite completeness and accuracy which is so essential to their full value.

General Accounts Assist Cost Records

Nor is this service an entirely one-sided proposition, for the general accounts furnish very material assistance to the cost records. Standing by themselves the latter are not self-sufficing since there is no way of ascertaining surely whether they are right or wrong. When they are properly connected with the general accounts, it is quite possible to verify the accuracy of cost accounts and a great deal more reliance can then be placed on the truth of the details they present.

There is no question but what interlocking of these sets of records is a prime essential to both, and of considerable importance to the business as a whole, for it should be remembered that if the cost records are interlocked with the general accounts they are also tied in with the production control records and hence form one of the significant binding elements of the control system of a business as a whole.

The way in which the union of the two sets of accounts is effected is by means of the controlling accounts and the entries made therein. Many of them have already been presented in preceding articles so that their treatment in the following paragraphs is largely a review of what has gone before. It has been felt advisable, however, to do this in order to present a complete survey of the relationships whose importance has been so often emphasized. It is hoped, also, that the additional notation for each entry which is given, showing the department in which it originated (*A* for accounting department and *C* for cost department) will aid in visualizing the facts presented.

Materials Accounts

As materials are one of the most important elements with which the cost records have to deal, and as a history of the development of the product in the factory is recorded in a series of accounts for materials, such accounts form a very convenient basis around which others may be grouped. In chronological sequence the first of these accounts is, naturally, that for stores. It may, of course, be broken up into several accounts if the stores are divided into a few principal classes for

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greater facility in control. Only one is shown here for the others would be similar.

STORES ACCOUNT

Voucher register— *A* — (Value of all purchased material from outside suppliers. Credit therefor to the accounts payable account.)	Stores journal— *C* — (value of all stores material issued. Debit therefor to in process, expense and miscellaneous accounts.)
Voucher register— *A* — (estimated cost of freight-in on purchased material. Credit therefor to freight-in account.)	This account ordinarily has a debit balance which represents the value at cost of the stores material remaining at the end of the month.

The freight-in account under the circumstances assumed above appears as follows:

FREIGHT-IN ACCOUNT

Voucher register— *A* — (actual cost of all transportation charges on material coming into the plant. Credit therefor to the accounts payable account.)	Voucher register— *A* — (estimated cost of freight-in on purchased material. Debit therefor to stores account.)
	General journal— *A* — (the debit balance of this after other entries are made. Debit to the profit and loss account.)

In most cases it will be found that there is a debit balance to this account which should be closed out as indicated. It results from the fact that transportation charges in are estimated on the basis of freight rates —and properly so—when the actual charges are for express or some other kind of transportation more expensive than freight.

Having completed the record of the stores material our attention is next drawn to one of the accounts to which in most factories the largest amount of stores material is charged when it is issued from the stores department. This account is the worked material in process account, and in it we find a record not only of the stores material but also of the other elements—labor and services—which need to be brought together to make the product.

WORKED MATERIAL IN PROCESS ACCOUNT

Stores journal— *C* — (value of all stores material used in making worked material. Credit therefor to the stores account.)	Worked material in journal—*C*—(value at estimated cost price of finished worked material. Debit therefor to worked material account.)
Worked material journal —*C*— (value of all worked material used in making worked material. Credit therefor to worked material account.)	General journal— *C* — (amount of the variation between actual cost value and estimated cost value of finished worked material when the actual cost has been greater than the estimated cost. Debit therefor to the worked material variation account.)
Payroll book—*C*— (value of labor used directly in making worked material. Credit therefor to payroll account.)	*Note:* When the estimated cost exceeds the actual cost, this account is debited with the difference and the worked material variation account is credited.
Burden journal— *C* — (value of the earned burden allocated to worked material. Credit therefor to the manufacturing burden account.)	This account ordinarily has a debit balance which represents the value at cost of the unfinished worked material remaining in the factory at the end of the month.
Voucher register— *A* — (value of direct charges assignable to the production of worked material. Credit therefor to accounts payable account.)	

Attention should be called to the fact that all of the entries to this account with one exception—and this exception represents transactions which very often do not occur—come from the records of the cost department. This emphasizes a point made in one of the earlier articles that without the aid of a cost department it is very difficult as a practical matter to obtain an inventory of the goods in process without shutting down the entire factory for that purpose. The use of the variation account in connection with the records for worked material has been explained in detail in a previous article. It may be well to remind the reader, however, that it becomes possible to credit the worked material in process and debit the worked material account with the value of the completed worked material as soon as it is finished, and so greatly aid the speed of preparation of records, a circumstance which is essential to the use of such records for the executive control purposes.

WORKED MATERIAL VARIATION ACCOUNT

General journal— *C* — (amount of the excess of the actual cost of finished worked material over the estimated cost. Credit therefor to the worked material in process account.)	*Note:* If the estimated cost is in excess of the actual cost, then the entry will be a credit to this account and a debit to the worked material in process account.

The balance of this account, whether it is a debit or credit, should be closed at the end of the year in the yearly profit and loss account. The account should not be closed each month, but should be recorded on the balance sheet as an adjustment to the worked material inventory.

There is another account which is very similar to the worked material in process account which may well be recorded at this place. It is the merchandise in process account.

MERCHANDISE IN PROCESS ACCOUNT

The debit entries are the same as those for the worked material in process account.	General journal— *C* — (value of all finished merchandise at actual cost. Debit therefor to the merchandise account, or debit therefor to the trading account.)
	This account customarily has a debit balance which represents the value at cost of the unfinished merchandise remaining at the end of the month.

The only difference between the two "in process" accounts is in the credits to them, and in the fact that there is no variation to be dealt with. This is the result of the fact that as merchandise is the final product it is possible to wait till all the cost elements are gathered in order to calculate the actual cost without causing any unnecessary delay. If the merchandise is made for stock, then the first of the credit entries shown is the one usually employed. If the goods are shipped as soon as conveniently possible after they are completed then this second entry is the one customarily found. In both cases, however, it will be noted that the cost department is the one which supplies the data. Both worked material in process and merchandise in process accounts may be subdivided if so desired, according to the kind of material of which they are the record. The same can be said of the worked material and merchandise accounts which are shown in the succeeding paragraphs.

Worked Material Account

Worked material in journal—*C*—(value at estimated cost price of finished worked material. Credit therefor to the worked material in process account.)

Worked material journal —*C*—(value at estimated cost price of all worked material issued. Debit therefor in process, expense and miscellaneous accounts.)

There is ordinarily a debit balance of this account which represents the value of the finished worked material remaining at the end of the month.

The entries to the merchandise account, when one exists, are so similar to those of the worked material account as not to need repeating here. The trading account, however, is an entirely different sort of record which is illustrated below.

Trading Account

General journal— *C* — (value at cost of all finished merchandise sold during the month. Credit therefor to the merchandise in process account, or credit therefor to the merchandise account.)

General journal— *A* — (amount of the administration expense for the month considered a part of the cost of selling. Credit therefor to the administration expense account.)

General journal— *A* — (value of the net sales for the month. Debit therefor to the sales account.)

General journal— *A* — (amount of the selling expense for the month. Credit therefor to the selling expense account.)

General journal— *A* — (the credit balance of this account. Credit therefor to the profit and loss account.)

It will be noted that all but one of the entries in this account come from records kept in the accounting department.

In presenting the worked material in process account, several debits other than those for material were shown, and it is now time to turn back to them and trace their course. The first of these items is for the payroll and, as was indicated, the record therefor is kept in a payroll account.

Payroll Account

Voucher register— *A* — (amount paid employees during month for services rendered. Credit therefor to accounts payable account.)

There is usually a credit balance to this account at the end of the month, representing remuneration earned by the workers but not yet paid nor payable.

Payroll book— *C* — (amount earned by employees during the month. Debit therefor to the in process, expense, and miscellaneous accounts.)

In most cases the debit to this account is made through the voucher register in order to have a record of all authorized expenditures in that one book of original entry. Of course, the wages are paid at once and so the additional entry showing the credit to the cash account is made at the same time. As the voucher is made out by the accounting department and recorded in the voucher register which is kept there, the source of the debit entry to the payroll account is the accounting department.

The next debit entry in the worked material in process account is the one for burden, and this, naturally, leads to a whole series of accounts. Of all the expense accounts in which the first stage of the development of burden is recorded, the one of most interest to us is the direct manufacturing expense account.

Direct Manufacturing Expense Account

Stores journal— *C* — (value of all stores material used indirectly by any of direct manufacturing departments. Credit therefor to the stores account.)

Worked material journal —*C*—(value of all worked material used indirectly by any direct manufacturing department credit therefor to the worked material account.)

Payroll book—*C*—(value of remuneration paid indirect workers in any direct manufacturing department. Credit therefor to the payroll account.)

Voucher register— *A* — (amount of all indirect charges expended for the benefit of any direct manufacturing department. Credit therefor to the accounts payable account.)

General journal—*A*— (amount of fixed charges incurred for the benefit of the direct manufacturing departments. Credit therefor to reserve depreciation and taxes accounts and to prepaid insurance accounts.)

General journal — *A* — (amount of miscellaneous charges incurred for the benefit of the direct manufacturing departments. Credit therefor to various accounts.)

General journal — *A* — (amount of the total debits to this account for the month. Debit therefor to the manufacturing burden account.)

Note: In some cases the manufacturing burden account is dispensed with and the debits made to it as described later in this article are made instead to the direct manufacturing expense account. Under these circumstances the credits to this account are the same as those described for the manufacturing burden account.

The accounts payable account, the reserve for depreciation accounts, the reserve for taxes accounts and the prepaid insurance accounts, are too simple and well known to need presentation here. The other expense can be summarized by reference to the above.

Auxiliary Manufacturing Expense Account

Entries similar to those for the direct manufacturing expense account.

Entry similar to that for the direct manufacturing expense account.

The handling of these two accounts is substantially the same. They have been separated one from the other because in this way it is easier to control the detail expenses for which they are the controlling accounts. The administration expense account has rather different entries.

Administration Expense Account

Entries similar to those for the direct manufacturing expense account.

General journal — *A* — (amount of the administration expense which may be considered a part of the cost of manufacturing for the month. Debit therefor to the manufacturing burden account.)

General journal — *A* — (amount of the administration expense which may be considered a part of the cost of selling for the month. Debit therefor to the selling expense account or to the profit and loss account.

The credits to the above account vary according to the decision in respect to the disposition of the administration expenses. This question was considered in the article dealing with the expenses under discussion and all that needs to be added here is to point out that it is one of the important connecting links between the cost records and general accounts.

The selling expenses are not of vital interest but a survey of the account in which they are recorded is given for the sake of completeness.

SELLING EXPENSE ACCOUNT

Entries are similar to those for the direct manufacturing expense account.	General journal — *A* — (amount of the debits to the account for the month. Debit therefor to the trading account or to the profit and loss account.)

The manufacturing burden account has been referred to several times above and has been discussed at some length in a previous article. It serves to gather together all the many details which go to make up the burden both earned and unearned and prepare it for its segregation into the two divisions.

MANUFACTURING BURDEN ACCOUNT

General journal— *A* — (amount of the direct manufacturing expense for the month. Credit therefor to the direct manufacturing expense account.)	Burden journal— *C* — (amount of the earned burden charged to the worked material during the month. Debit therefor to the worked material in process account.)
General journal— *A* — (amount of the auxiliary manufacturing expense for the month. Credit therefor to the auxiliary manufacturing expense account.)	Burden journal— *C* — (amount of the earned burden charged to merchandise during the month. Debit therefor to the merchandise in process account.)
General journal— *A* — (amount of the administration expense for the month which may be considered a part of the manufacturing cost. Credit therefor to the administration expense account.)	General journal— *A* — (debit balance of this account, i.e., the unearned burden. Debit therefor to the profit and loss account.)

The record of the manufacturing burden account completes the monthly history of the burden insofar as the production side of the business is concerned. In all of the accounts in which the development of the burden is entered it will be noted that both the cost and accounting departments are called upon for data. It should be obvious from this that in those systems in which the entire record of expenses is kept in the accounting department either the accounting department is doing what is normally considered the work of the cost department—which, under some circumstances is quite justifiable—or else the accounts are deficient in certain important respects.

ACCOUNTING FOR IMPROVEMENTS

So far our attention has been confined to the interlocking of records which deal with the fabrication of the product. It must not be forgotten that the cost department also has the task of keeping track of the cost of improvements produced by the company itself. The first account to appear in the chronological order of the record of such assets is the improvements in process account. This account may be divided according to the various classes of improvements if it seems desirable. The kind which is most likely to be segregated is the group comprising the tools because of the peculiar treatment which they often receive and which is noted below. The reason for this method of handling it will be remembered, was discussed at some length in an earlier article.

IMPROVEMENTS IN PROCESS ACCOUNT

Stores journal— *C* — (value of stores used in making improvements. Credit therefor to the stores account.)	General journal— *C* — (value at cost of all completed improvements except tools. Debit therefor to machinery, furniture and fixtures and buildings accounts.)
Worked material journal —*C*— (value of worked material used in making improvements. Credit therefor to the worked material account.)	General journal— *C* — (value at cost of completed tools, not replacing wornout or discarded ones. One-half the debit therefor to the tool account, and one-half to tool maintenance account.)
Payroll book—*C*— (value of labor used directly in making improvements. Credit therefor to the payroll account.)	General journal— *C* — (value of all completed tools replacing wornout or discarded units. Debit therefor to tool maintenance account.)
Voucher register— *A* — (value of direct charges incurred in the making of improvements. Credit therefor to accounts payable account.)	There is ordinarily a debit balance to this account which represents the value of the improvements still in process at the end of the month.

It should be noted here that both the cost and accounting departments contribute entries to the account and that the larger number come from the cost department. This fact needs to be emphasized for all too frequently the impression exists that the work of the cost department is concerned only with the records of the product. The description of the task of the cost department given in one of the early articles to the effect that it consisted of keeping a record in terms of dollars and cents of what goes on in the factory should be recalled here. Just so surely as additions and improvements are made by the company itself, it is necessary for the cost department to take an important share of the work of keeping track of them.

The varied fixed asset accounts for equipment and improvements are all handled in substantially the same fashion so that only one is given as an illustration.

MACHINERY ACCOUNT

General journal— *C* — (value at cost of all completed machinery made by the company itself. Credit therefor to the improvements in process account.)	General journal— *A* — (value at cost of all machinery discarded. Debit therefor to the profit and loss account.)
Voucher register— *A* — (value at cost of all machinery purchased from and installed by another concern. Credit therefor to the accounts payable account.)	There is usually a debit balance to the account which represents the value at cost of the machinery owned by the company.

In the case of the tool account, the values to be debited and credited would be one-half the cost value instead of the full cost value as in the instance shown above. Except for this variation the account should be handled in the same manner as the machinery account.

There is one other set of accounts which are intimately connected with the fixed asset accounts and which have entries originating in the cost department—the reserve for depreciation accounts. One of them is shown here.

RESERVE FOR DEPRECIATION OF MACHINERY ACCOUNT

General journal—*C*—(amount of depreciation accumulated against any machine at the time when the unit is discarded. Credit therefor to the profit and loss account.)	There is customarily a credit balance to this account which represents the amount of depreciation on the machinery owned by the company to date. Combined with the debit balance of the machinery accounts it shows a fair valuation of the machinery as of the date in question.
General journal—*C*—(amount of depreciation accumulated against the machinery during the month. Debit therefor to the appropriate fixed charges account.)	

It is frequently overlooked that the entries to the reserve for depreciation accounts are prepared by the cost department whenever that department has been properly organized. It should be remembered, however, that the plant register is usually kept in this department and that the fixed charges schedule sheet is prepared there.

It is hoped that the more or less diagrammatic form in which the more important accounts affected by both cost and accounting departments are presented will be a real aid in grasping the interlocking character of the records of the two departments. It is a point which has been emphasized by all sound writers on industrial cost accounting and the stress laid upon it is fully justified. The attempt has been made here to present the subject in a somewhat different way from that most often employed in the effort to make it clearer than ever before to the reader. At the same time it is believed that the present arrangement will serve to bind together many details which have been discussed at length in preceding articles, and so give a cohesiveness to the subject which will make it of greater value to the student of cost accounting.

Embrittlement of Malleable Cast Iron Resulting from Heat Treatment

Recent investigations at the Bureau of Standards have shown that commercial malleable iron is often embrittled by quenching from certain temperatures in the "blue-heat" range. The low shock resistance of such material after hot-die galvanizing has brought this fact to the front. The present study of the problem showed that the magnitude of this deterioration varied with different samples of iron, the Izod impact test being used as a convenient means for measuring the effect. The embrittlement was limited to a fairly definite range of quenching temperatures. Aging after treatment did not affect the results, but the rate of cooling from the blue-heat range was important. If the malleable iron was slowly cooled instead of quenched from these temperatures, the impact resistance was much higher. It was also found that the upper limit of the embrittlement zone lay a few hundred degrees Fahrenheit below the critical point. Quenching from temperatures in this intervening zone increased the impact-resistance of the iron and made it immune to the blue-heat deterioration. The information obtained did not solve the question of the fundamental cause of the embrittlement but did point out a method for eliminating it.

This work is described in Technologic Paper No. 245, for sale by the Superintendent of Documents at 5 cents per copy.

Sales Hints for the Machine Designer

BY ENTROPY

Anyone who has followed the machine-tool market for the past ten or twenty years must be struck with the thought that a great many new machine tools that have been presented are not on the market now. Of course there are several possible reasons for the withdrawal of a new machine, but many of these failures must have been the fault of the designer.

The most common error is lack of weight and substance. An inventor builds a sample machine; his interest is in making something that will run; he fathers it, humors it, and demonstrates its running qualities; but he fails perhaps to realize that the purchaser cannot afford to hire men to run it who have his sympathetic understanding, and the purchaser will not be patient with many delays in its operation. Light machines, subject to many breakdowns are usable only if enough of them are operated to make it profitable to employ a man to spend his whole time keeping them in order.

SIMPLE DESIGN HELPS SALES

Another obstacle which has seemed to stop many otherwise good designs from becoming good sellers, is an apparent complexity of the design. Some of these machines have been redesigned and sold, not by changing the mechanism or making it less complicated, but by boxing up the complex parts so that they did not show. If, at the same time, a complete unit has been made of the box and its contents, so that a new one can be substituted in a few minutes, the market has seemed to absorb the resulting machine with little difficulty.

Still another bugbear of the purchasing public has been friction drives. The ordinary belt of leather or canvas is the most dependable of all the friction drives, but the reason is that through many years of experience we have learned not to expect too much from it. When we put on a new belt we do not load it to its breaking point—we give it a large factor of safety. If we gave variable speed devices with friction drives one-half the factor of safety that we give to belts, most of them would work satisfactorily.

Electric drives have also wrecked many otherwise satisfactory machines. A shop with motor drives on the individual tools is at least up-to-date, whether it is more efficient or not. The principal troubles with electric drives have been too small motors, and too great an effort to use variable speeds on alternating current.

It is natural to think that if one horse can pull a buggy, a one-horsepower motor ought to drive a runabout and, on the same principle, a lathe that was driven by a belt that would not carry more than a half of one horsepower, ought not to need a five-horsepower motor. The difference is much the same in both cases. When the horse gets tired he stops or slows down; when the belt is overloaded it slips, and it slips a great deal more than the operator thinks it does. The other difference is that when we get into a runabout we want it to run up hill about six times as fast as the old horse ever trotted down hill. The customer who buys a machine with a motor drive expects to get his money's worth, and he cannot do it with an undersized motor. He won't be satisfied with the same production as he had before he motorized his shop, because he usually has too much pride in his own judgment for that.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Graphical Method for Proportioning Broach Teeth

BY CLARENCE D. SCROM

In designing broaches for polygonal holes, it is desirable to so proportion the sizes of the teeth that each one will remove an equal amount of stock, thus protecting the broach from irregular stresses. Under these conditions, the depth of cut taken by successive teeth should not be equal, but varying in amount throughout the length of the broach.

In Fig. 1 is shown a layout of a round hole which is to be broached to the square designated by the dotted

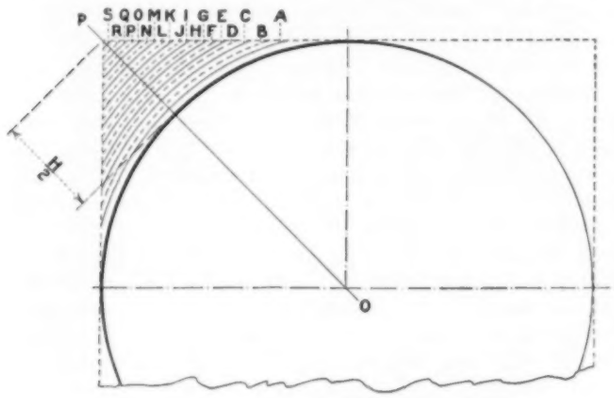


Fig. 1—Layout of square broached hole

lines, the side of the square being equal to the diameter of the hole. For the sake of accuracy, this layout should be made to a large scale, 10 to 1, or 20 to 1 if possible. The diagonal *OP* is first drawn and the distance $\frac{H}{2}$ is then divided into equal parts, the arcs *A*, *B*, *C*, *D*, etc., being drawn through the points.

For use in making a graphical chart for the height of the teeth, it is necessary to find the lengths of the alternate arcs *A*, *C*, *E*, *G*, etc., and this is best accomplished by the graphical method shown in Fig. 2.

The chart shown in Fig. 3 is constructed as follows: Draw the horizontal line *XY* and upon it lay off spaces equal to one-half the length of the arcs *A*, *C*, *E*, *G*, etc., to the same scale as the layout of Fig. 1. Erect perpendiculars at each point as shown, and at *X* erect a perpendicular equal in length to *H* and to the same scale. After dividing this perpendicular into ten equal parts and drawing horizontal lines to intersect the corresponding perpendiculars, the curve may be drawn through the points of intersection as shown. The tooth line *UV* is then drawn equal in length to *XY*, and divided according to the number of teeth the broach is to have. The broach used in the example has 40 teeth.

The method of determining the height of the teeth is shown by the dotted line. The twelfth tooth is being considered and it is found that its height should be approximately 0.043 in., assuming that the broach is to cut a 0.750-in. square hole from a round hole 0.750 in. in diameter. Broaches for square or hexagonal holes, as shown in the circles on the diagram, are all handled in this manner. Similar methods may also be used for square holes with rounded corners, and square holes in which the diameter of the hole is larger than the width of the square.

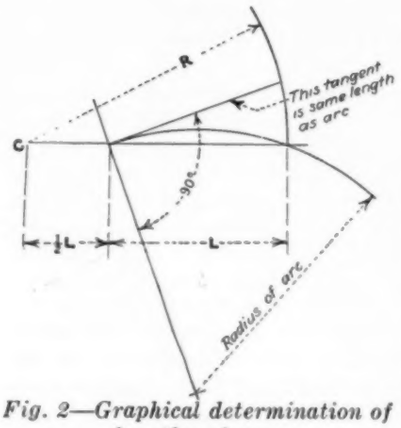


Fig. 2—Graphical determination of lengths of arcs

In cases where the hole is simply enlarged without altering the shape, the depth of cut decreases slightly with each successive tooth. The curve for broaches of this type is nearly a straight line, and a true

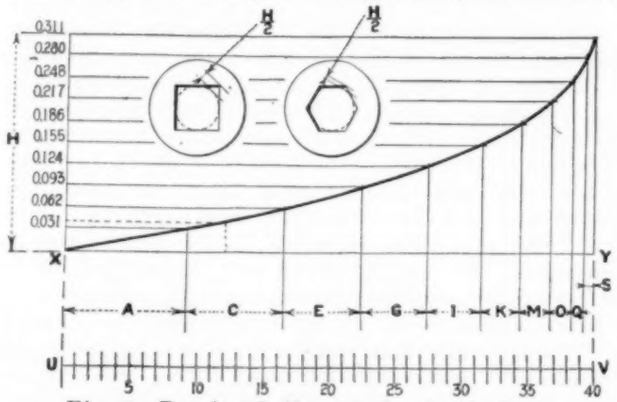


Fig. 3—Developed diagram for tooth sizes

straight-line curve is also developed for broaches to cut keyways or splines in holes.

The method described can also be adapted to the design of push broaches, but then the diagram should be so constructed that the first teeth do not remove as much stock as the last teeth. This is because the length of the broach in compression, or the distance between the engaged teeth and the end of the broach attached to the machine, decreases as the broach is forced through the hole. As this distance becomes smaller, greater loads can be carried by the broach.

Locomotive Valve-Stem Trams

By F. M. A'Hearn

Frequent references to railway repair shop practices appearing in the columns of the *American Machinist*, bring to mind some of the troubles of locomotive maintenance during the "service" term, between shoppings for classified repairs. Valve adjustments or "running them over" is one of these troubles.

Regardless of the type of valve gear used, or the refinements practiced in making adjustments at the time of classified repairs, "valves-out-of-square" is a common complaint. When it is necessary to "run valves over" the first move should be to know that the tram used in adjusting the valve stem is of the proper length. Any variation between the tram first used to

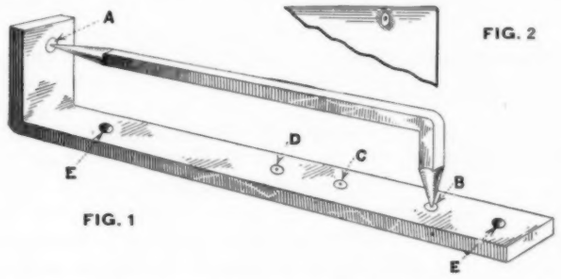


FIG. 1

FIG. 2

Fig. 1—Tram and gage for different locomotives.
2—Measuring point on cylinder.

scribe the port marks upon the stem, and the one used at some other shop, will make a corresponding error in the setting, unless new port marks are taken at each setting.

A practice followed in many shops is to provide a plate similar to the one shown in Fig. 1, the plate being kept in the toolroom at the main shop, where all new trams are made to match the plate. Where this practice is followed the engine classes for which the trams are intended are usually stamped upon the tram. No trouble arises so long as the trams are not changed from their original dimensions. But when either end is blunted and re-sharpened, or the tram bent, the change may be the cause of faulty adjustments to the valve gears, without being detected.

To avoid this chance of error, a set of trams of suitable lengths for the various classes of locomotives involved should be prepared, the lengths preferably in even inches. A reference plate similar to Fig. 1 should also be prepared and the set suitably marked and retained in the main toolroom. Duplicate sets of trams should be made, no identification marks being made upon the trams, but suitable marks made upon the plate accompanying the set. Points *A*, *B*, *C* and *D* are punch marks surrounded by a circle. Beneath points *B*, *C* and *D*, are marked the various classes of locomotives for which each tram is intended. Holes *E* and *E* are provided to fasten the plate against the wall in an upright position, with point *A* at the bottom.

This method necessitates that the mechanic selecting a tram must try it upon the reference plate before using. Thus any error in length will readily be observed and steps can be taken to correct it.

As a further protection against mistakes in checking valve adjustments, it has been found advantageous to establish the point on the cylinder from which measurements are made, in such a manner that the punch mark can readily be distinguished. Some times two or more marks may be found upon the cylinder casting, leaving the mechanic at a loss to know which point is the correct one.

A good practice is to chip a small flat surface near the upper face of the cylinder casting, where slide valves are used, or at some similarly convenient point on piston-valve cylinders, and drive the point of the centerpunch into this surface. After marking the point surround the punch mark, as shown in Fig. 2, by a circle, or figure 0, about ¼ or ⅜ in. in diameter.

A Multi-Purpose Lathe Tool

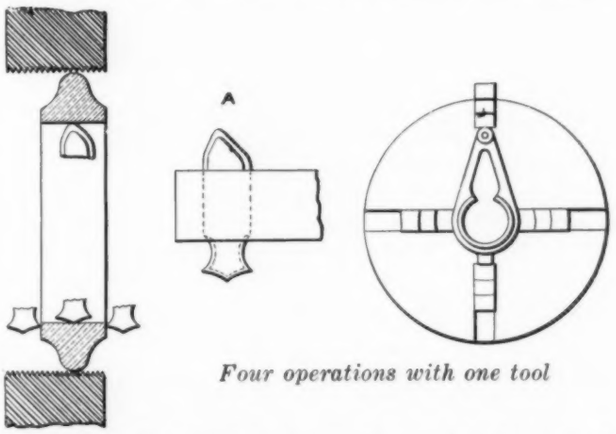
By Charles D. Folsom, Jr.

The wide-awake machinist who tries to think up the quickest way of doing things often makes the engine lathe deliver results that would ordinarily be thought possible only with a screw-machine, or, at least with a lathe having a turret toolpost attachment.

As an example, we had some work to be machined in lots running from 25 to 50 pieces. The material was cast brass and the pieces were similar to brake bands. The work had to be bored out to a tolerance of a few thousandths of an inch, with a good finish, and faced on both sides of the central boss.

The frail nature of the work made it difficult to handle, especially in view of the fact that there was a break in the cut, which tended to dull the tools quickly and to loosen the piece in the chuck. Since there was about ¼ in. of diameter to come off, it was necessary to use separate tools for rough and finish boring.

Changing tools for each operation would have taken a lot of time and would have made it necessary to stop and caliper many times in finish-boring each piece;



Four operations with one tool

therefore a single tool was ground so as to take care of all the operations at one setting, and thus allow the use of the marks on the cross-slide dial instead of calipering.

One end of the tool was ground as at *A* for the rough-boring out, and was made to cut upside down, so that the lathe could keep on running in the same direction for both roughing and finishing. The other end was ground with clearance on both sides, somewhat like a key-seating tool, for facing both sides, and with a little hump in the middle for a light finish-boring cut.

This tool made it possible to turn the pieces out in really surprising time. In fact, it took longer to get them trued up in the chuck than to machine them.

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The Lubrication of Machinery

A PAPER presented at the Production meeting of the Society of Automotive Engineers at Detroit pointed out defects found in many machine tools used in the shops building automobiles. One of the chief criticisms was that too little attention was paid to provisions for lubrication.

There are, of course, a number of notable exceptions to the criticism but the fact still remains that machines are still built in which far too much dependence is placed on the oil can in the hands of the operator. And with the kind of men handling machines in many shops hand lubrication is almost invariably neglected.

It was pointed out, however, that many of the criticisms noted applied only to machine tools of the vintage of 1914 or earlier and that an inspection of machine tools built during the past few years would compare much more favorably with the ideas set forth as being modern practice. This was claimed to be especially true of the countershafts supplied with modern machines, a point especially criticised by the author of the paper.

There is room for improvement in the lubrication of many machine tools and the same is true of the automobile, especially the chassis, or all parts behind the motor. The criticism, however, shows the very natural tendency to criticise machines as we know them from our own experience, without being aware that some at least, of the defects have been eliminated in the later designs.

Honest criticism, however, never does any harm and both sides could easily benefit from such a discussion.

Production Manager— A Bigger Job

THE INCREASING size of manufacturing plants, as exemplified by the large automobile shops, is bringing changes in the relationship of the shop and the executive ends of the business. We formerly thought of the production manager as being connected entirely with the machine department and interested solely in the cost of machining the various parts of a product. Now, however, the term production manager is coming to mean the man responsible for the total output of the plant, machining costs being but a very small item in many cases. In some plants the old and frequently misused term of efficiency engineer is used to designate the man responsible for the costs of machining.

The new production manager is not always either an engineer or a man with a knowledge of machine work. Other men, shop superintendents, master mechanics, tool equipment men, look after the cost of machining and of getting the parts to the assembly line. He must see that they do, see that they co-operate and co-ordinate, see that the completed product gets through the shop on schedule.

The new production manager has in a way taken over part of the work of the old general manager or works manager. In a few instances he also acts as purchasing agent and so keeps tabs on the cost of material and equipment as well as of labor. But he is really a production manager in the fullest sense and the increasing business handled by large plants still leaves plenty of work for the general and works managers. It is a broader and better job than ever.

An Overproduction of Farmers

A PLAIN case of overproduction is painfully evident in that section of the United States known as the Northwest. Not only is there too much grain being produced, but there are too many farmers doing the producing. The result is that many of them are broke and can't do anything about it except make a tremendous noise through their few representatives at Washington.

It would be easy to say to them, "Why do you make so much noise? You have overproduced. When industry overproduces, it takes its loss and curtails until the market hardens again." But it would do no good, and it must also be remembered that the Government urged these same farmers only a few years ago to increase their production of grain as much as possible.

Certain industrialists are very much concerned over the shortage of immigrant labor. If they would make it possible for some 25,000 of these destitute farmers to take some of the good industrial jobs that need filling and that would be well within their capabilities, there would be a sudden end to the unholy row. They would be getting very much better men and would be doing their country and themselves a service.

Just Suppose

JUST SUPPOSE you were the happy recipient of a legacy of, let us say, $20,000,000 and that you were confronted with the problem of investing it. Would you buy 6 per cent railroad stock or 6 per cent industrial bonds, or some municipal bonds? The stocks and bonds would give you an income of $1,200,000 of which Uncle Sam would claim about $750,000 leaving you a measly $450,000. The municipal or state bonds would give you a mere 4 per cent or 5 per cent at the best. This would be $800,000 or $1,000,000 of which your Uncle S. would not claim anything at all. What is that you say? Such a rich fellow, you claim, ought to be patriotic enough to pay his tax willingly. Well, perhaps he ought to, but what would *you* do? You say you have no chance to get $20,000,000 or anything like it? Well, but

Just suppose.

Shop Equipment News

Sommer & Adams Multiple Spindle Spline Hobbing Machine

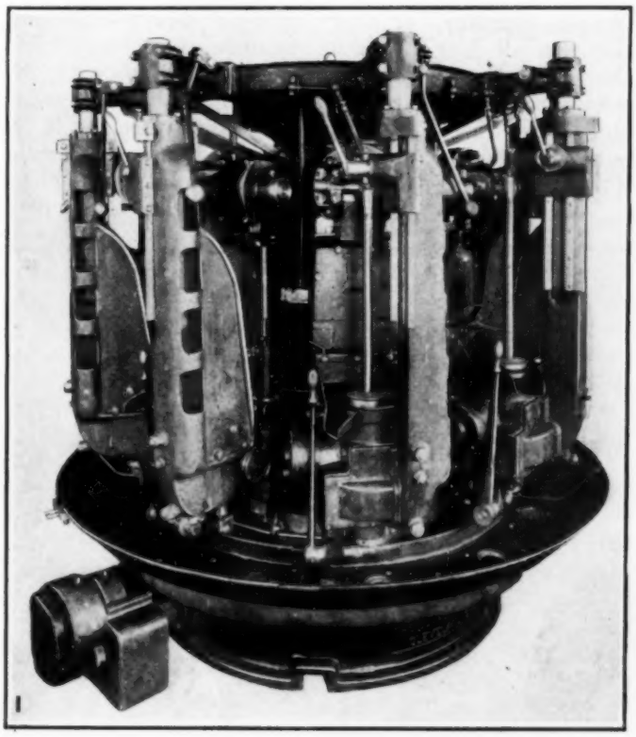
A machine in which the multiple spindle design is adapted to the performance of production hobbing operations is now being marketed by the Sommer & Adams Co., 18511-18 Euclid Ave., Cleveland, Ohio. This machine was designed for the special purpose of hobbing splines on one end of automobile axle shafts and the accompanying illustrations show the machine in action on such work.

There are eight separate and independent working units mounted in a turret which rotates continuously about a vertical axis, and the machine therefore completes the operations on eight pieces during each revolution of the turret. A sturdy column at the center of the machine centers the turret on the base and encloses a vertical shaft, through which the power is delivered from the drive mechanism in the base to the hob and the work. The hob spindles are mounted on the outer wall of the turret, as will be noted from Fig. 1, and the work is held in units located on the outer periphery of the machine.

A work-holding unit consists of a driving head *A*, Fig. 2, to which a vertical column *B* is bolted. This column carries a tailstock *C*, providing a center support for the upper end of the work *D*, the other end being held in the chuck of the driving head. The entire unit is arranged to reciprocate vertically, the driving head being guided by vertical ways on the turret, and the upper end of the column being held in alignment by the guide rod *E*, which slides through the bearing *F* on the turret top casting *G*. This reciprocating action of the work-holding unit causes the work to move in an axial direction past the hob and provides the feed for the cutting operation.

An inspection of Fig. 2, which shows the machine with the chip pan removed, shows how the vertical reciprocation of the work-holding unit is obtained. A roller *H* is attached the lower end of the unit and is always in contact with a stationary cam *I*, extending clear around the machine on the top of the base casting. The cam determines the vertical position of the work-holding unit throughout its travel around the machine. The unit at the extreme right of the machine has completed its operation, and it will be noted that the roller is on the highest point of the cam and approaching the low point *J*, which is the loading position of the machine.

At point *J* the finished work is below the hob and can be replaced with a new blank as the roller traverses the lower cam section. A



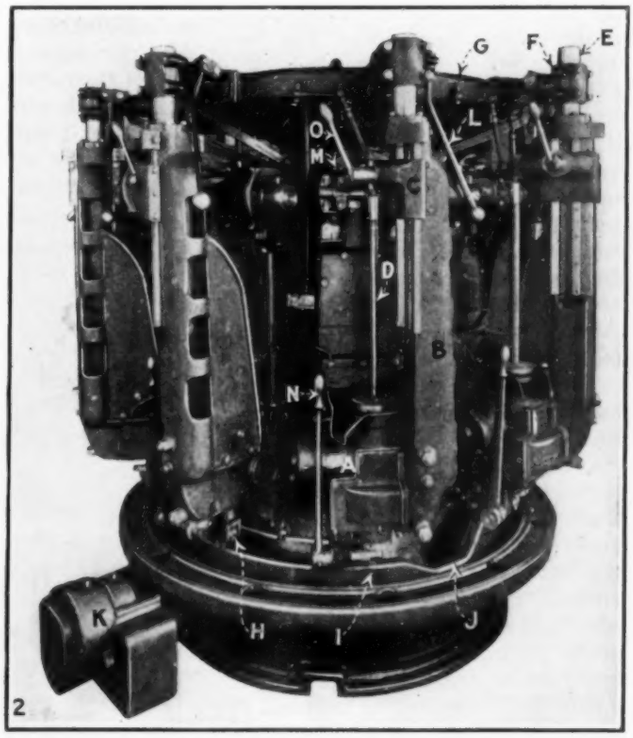


Fig. 1—Sommer & Adams Multiple Spindle Spline Hobbing Machine. *Fig. 2—Chip pan removed to show cam*

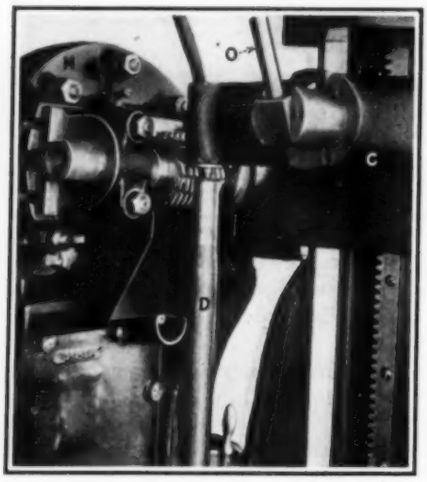


Fig. 3—Close-up view of hob and work

sharp rise of the cam at the end of the loading position brings the work into the cutting position and from there to the high point the rise of the cam is gradual to provide the necessary feed. The close-up view of the hob and the work, Fig. 3, shows their relative positions.

The machine is driven by a 7½-hp. motor which is geared to a horizontal drive shaft in the base of the machine, and from this shaft the power is taken for driving the hob and the work and revolving the turret. The drive shaft passes through the base to the gear box *K* in which change gears for adjusting the speed of the turret are enclosed, and from the gear box a shaft extends back to a position near the center of the machine where it drives a short vertical shaft through a worm and wormwheel. A pinion at the upper end of this shaft meshes with a ring gear fastened to the turret. The center-column bearings which center the turret are bushed, and the weight of the turret is carried on a ball thrust bearing near the top of the column and a slide on the base.

The drive for the hob spindles and work heads is obtained from a vertical shaft located at the center of the column. This shaft is driven through bevel gears from the drive shaft in the base and carries at its upper end a large bevel gear. Meshing with this gear are eight bevel pinions, running loosely on shafts which extend radially toward the hob drive mechanism. A Carlyle-Johnson friction clutch operated by the handle *L* is provided to transmit the power from each pinion, and by this means each unit can be started or stopped independently.

From the radial shaft the hob is driven through change gears and bevel and spur gears. The hob carriage *M* can be swivelled to whatever angular position is required and an axial adjustment for the hob is also provided. Each unit has an independent coolant pump.

The power for driving the work head is transmitted from the radial shaft, mentioned above, through bevel gears to a long vertical shaft which extends downward to the head. Change gears are provided in the head so that the proper relative motion of hob and work can be obtained. The lower end of the work is tapered and fits a socket in the work spindle and a knockout for releasing the finished work is operated by the handle *N*. The positioning and clamping of the tailstock *C* when replacing the work is done by means of the lever *O*.

The reservoir for the coolant is located in the base from which it is circulated by the independent pumps. Ball bearings are provided on practically all shafts and at all thrust points. Shafts are made of carbon steel and all driving gears are heat-treated.

The machine is intended for high production work, and it is claimed that such work can be accomplished with a great saving in floor space and with a minimum of handling. At a rate of one revolution of the turret in four minutes the output of the machine will be 120 pieces per hour, and it is said that faster speeds than this can be maintained. The machine weighs approximately 16,000 pounds.

"TEC" Long Wheelbase Truck

A recent addition to its line of material handling equipment has been made by the Terminal Engineering Co., Inc., 17 West 44th St., New York, N. Y., and consists of a long wheelbase truck. This truck will carry a load of 5,000 lb. and its large load-carrying area makes it available for bulky goods.

The driving and handling arrangements on this truck are exactly similar to those for the shorter model manufactured by the same company. All four wheels drive and all four wheels steer, each wheel being driven by a vehicle-type motor enclosed in a weather-proof case. The wheelbase is 91 in. in length, but it is said that the turning radius is exceptionally short.

The truck body is mounted on four leaf springs and the wheels are fitted with 20x5-in. solid rubber tires. Brakes of the internal expanding type are regularly provided on two of the wheel units, but all four wheels can be fitted with brakes, if desired. It is said that the large wheels, individual drive, and spring suspension allow the operation of this truck without the construction of special runways, since it is able to traverse cinder fill and snow and ice.

The truck is designed to use separable bodies, being driven under them as they stand on legs and picking them up by means of four screw jacks, operated by a motor of the same frame and characteristics as those used on the wheels. It is stated that these jacks will elevate the loaded body to the full height of 9½ in. in 5 sec., though the load may

"TEC" Long Wheelbase Truck

be carried in a partially raised position if desired. Provision is made for slippage at top and bottom of the jack stroke to avoid jamming.

A spring drawhead is provided so that the truck may be used as a tractor. The coupler is automatic and released from the operator's position in order to save the time usually lost in hand coupling. Head and tail lights are provided so that the truck can be operated in dimly lighted interiors.

Francke High-Speed and Pressed Steel Flexible Couplings

Flexible couplings for high-speed transmission, and a pressed steel type for fractional horsepower drives, have recently been added to the line of Francke flexible couplings manufactured by Smith & Serrell, Newark, N. J.

The high-speed type is illustrated in Fig. 1 and consists of two similar flanges to be fastened to the ends of the shafts, between which are placed the flexibly connected drums. An inner drum is bolted to one flange and the outer drum to the other. Flexible laminated pins are disposed

Fig. 1—Francke High-Speed Flexible Coupling

in radial holes in the inner drum and extend into slotted keepers which are located parallel to the shaft axis in the outer drum. These keepers can rotate and slide endwise in the outer drum, and the bearing of the bundles of springs or laminations is, therefore, constant and a surface bearing, instead of line or point contact. The bundles of springs can also slide in two directions so that full flexibility is obtained.

The coupling is easily accesssible for inspection or repair since the drums can be removed without disturbing either of the connected machines. This is done by simply taking out the bolts which fasten the drums to the flanges. In lining up the shafts a straight-edge may be placed across the flanges.

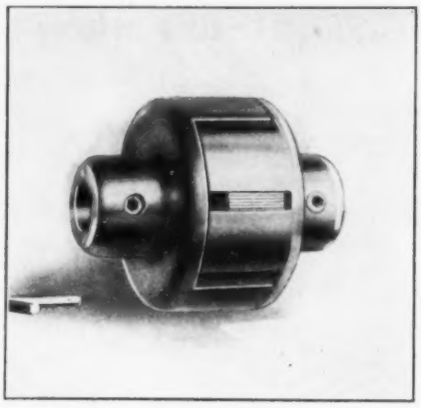


Fig. 2—Francke Pressed Steel Flexible Coupling

The high-speed couplings may be lubricated by either grease or oil and are built to retain the lubricant. The proper lubrication is determined by the installation and driving conditions, and a continuous flood lubrication may be used if the coupling is inclosed in a suitable casing.

These couplings are built in sizes which will transmit up to 300 hp. per 100 r.p.m., and will operate at 2,500 r.p.m. The smallest size listed will transmit 6½ hp. per 100 r.p.m., and operate at a speed of 8,500 r.p.m, maximum.

The pressed steel type is shown in Fig. 2 and is made for shafts up to ¾ in. in diameter. These couplings will transmit up to 1 hp. at 1,800 r.p.m. They consist of two similar pressed steel flanges and a center spring cross disposed between them. The coupling is flexible in all directions and extensible lengthwise. Bores smaller than ¾ in. in diameter are obtained by using inserted bushings or, in case a large number of couplings is required for a smaller shaft diameter, the bore can be drawn to fit the shaft.

"Jolite" Cutting Tools

A high production cutting material whose base is high-speed steel has recently been announced by the Jolite Tool Co., 610 Sycamore St., Milwaukee, Wis. This material is obtained through a process which is said to provide a "red hard" cutting edge and also stands up well when cold.

It is stated that the "Jolite" process can be duplicated with exactness and that the product is exceptionally uniform. The steel is hardened clear through and it is unnecessary to give it any further heat treatment before using. In fact, any attempt to retreat the material nullifies the process.

The feeds and speeds used with the material must be the same as for the steel from which it is produced, that is, for high-speed steel. Among the advantages claimed are a keener cutting edge, additional strength, and resistance to wear.

Form cutters can be treated by this process, it is said, and such cutters have met exceptional production tests. Tools made by this process can be given a greater rake than untreated tools, producing easier cutting action.

Starrett Oil Gaging Tape

A reel tape for gaging extra-heavy oils is now being marketed by the L. S. Starrett Co., Athol, Mass., and is shown in the accompanying illustration. The tape is ½ in. wide and is mounted in a nickel-plated metal

Starrett Oil Gaging Tape

frame. To make the handling of the tape easy, the handle is made sufficiently long to give good leverage and the drum is cored for lightness. The handle is hinged so that it can be folded either to right or left and will lock the tape at the desired length.

The bob or weight is nickel-plated and weighs 18 oz. The tape is 50 ft. long and is graduated in feet, inches and eighths of an inch.

Cincinnati 30-In. Geared Head Lathe

An addition to the line of geared head lathes manufactured by the Cincinnati Lathe & Tool Co., 3207-3211 North St., Cincinnati, Ohio, consists of the 30-in. size, shown in the accompanying illustrations and which have been placed on the market recently.

In Fig. 1, the lathe is shown as furnished with a single pulley belt drive, but a motor for driving can be mounted on the head, as in Fig. 2. The motor drives the pulley shaft by means of a silent chain and sprockets.

The swing of the lathe over the bed moving the headstock cover. An opening in the cover is provided, through which the interior of the head may be inspected without the necessity of removing the cover. The clutch is an integral part of the head and the pulley on it is supported without any overhanging strain on the drive shaft. The clutch is controlled by levers at the right-hand side of the apron and at the headstock, and a clutch lever at the top of the head can be furnished, if desired.

Twelve spindle speeds are quickly

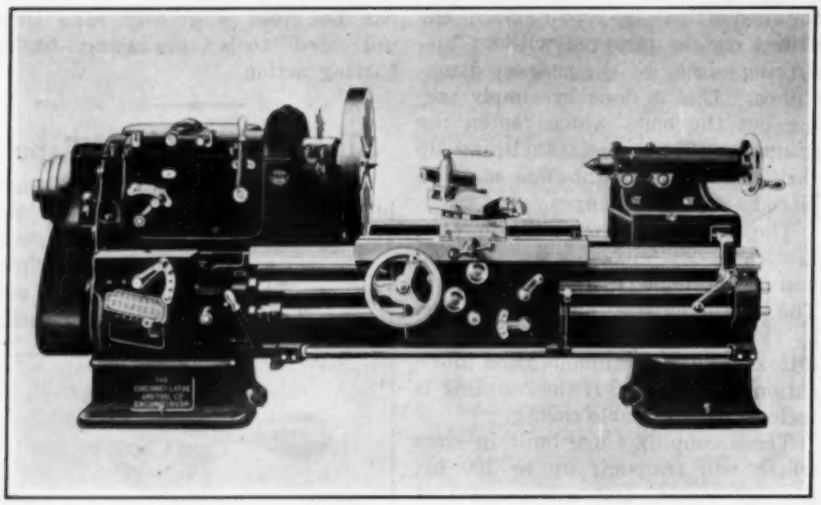


Fig. 1—Cincinnati 30-in. Geared Head Lathe

is 30¼ in. and over the bottom slide, 21 in. The nose of the spindle is 4 in. in diameter and the spindle bearings can be adjusted without re-

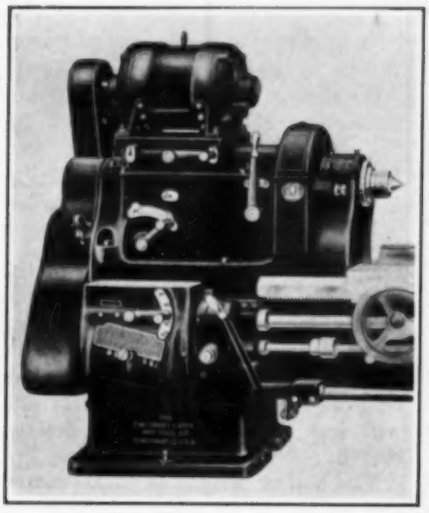


Fig. 2—Headstock end of Cincinnati 30-in. Lathe

available through the 13 gears of the headstock and not more than one pair of gears are in mesh for any of the speeds. The range of speeds is from 9 to 325 r.p.m. The hole through the spindle is 2⅛ in. in diameter and the centers have a No. 5 Morse taper. All the spindle gearing is enclosed in the head and a splash system of lubrication is used, an indicator to show the amount of oil in the head being provided, together with a suitable settling basin and drain.

A view of the head end of the lathe from the front is given in Fig. 2, and shows the arrangement of levers for controlling the speeds and feeds. In the design and positioning of these levers particular attention has been paid to the hand clearance so that it is impossible to pinch the hands. A range of 32 speeds or threads can be obtained by shifting only two levers. The range of feeds possible is, however, unlimited.

The carriage bearing on the bed is

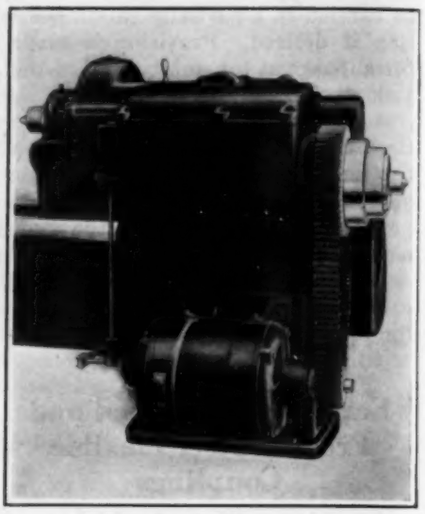


Fig. 3—Motor drive for Cincinnati Lathe

36 in. long and the apron is of the usual design adopted for other sizes of lathes in this line. The diameter of the tailstock spindle is 3⅜ in., and the distance between centers with a 12-ft. bed is 84 inches.

A motor drive arrangement for this lathe in which the motor is mounted on the back of the frame leg is shown in Fig. 3. In this illustration the drive chain guard has been removed so that the sprockets and silent chain by which the motor drives the pulley shaft can be seen. The machine requires a 10-hp. motor running at 1,200 r.p.m., and weighs, with a 12-ft. bed, 10,200 lb. The usual equipment is furnished.

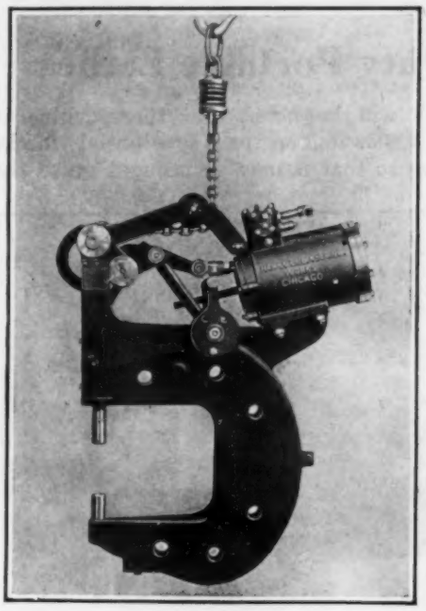
Plunger Suspension for Hanna Riveting Machines

The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has recently developed a plunger suspension for its pneumatic riveter, by the use of which the upper die remains stationary and the lower die is movable, when the machine is suspended as shown in the accompanying illustration.

A chain, attached to the upper die plunger, passes over a sheave on the upper toggle pin and under a sheave placed at the top of the machine. The section of the chain leading from the latter sheave to the suspension hook is directly over the center of gravity of the riveter when the die axis is vertical.

When the upper die is placed against the rivet head and the mechanism of the riveter is operated,

the entire frame is lifted, pressing the lower die against the protruding part of the rivet shank below the work and forming the rivet head from below. This action allows the placing of the rivets in the holes



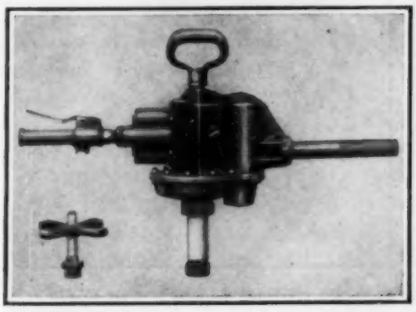
Plunger Suspension for Hanna Riveting Machines

from above and increases the speed of operation with a given number of men in the crew. The rivets may be placed in the holes in advance of the riveter, less time being consumed in the placing, and the continuous operation of the riveter is not interrupted.

This suspension rigging is furnished in addition to and independent of the usual bail suspension, and the riveter can be suspended by either method.

Chicago No. 36 Red Giant Air Drill

A portable air drill, designed especially for reaming, and adapted to both drilling and reaming operations, has recently been placed on the market by the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y.



Chicago No. 36 Red Giant Air Drill

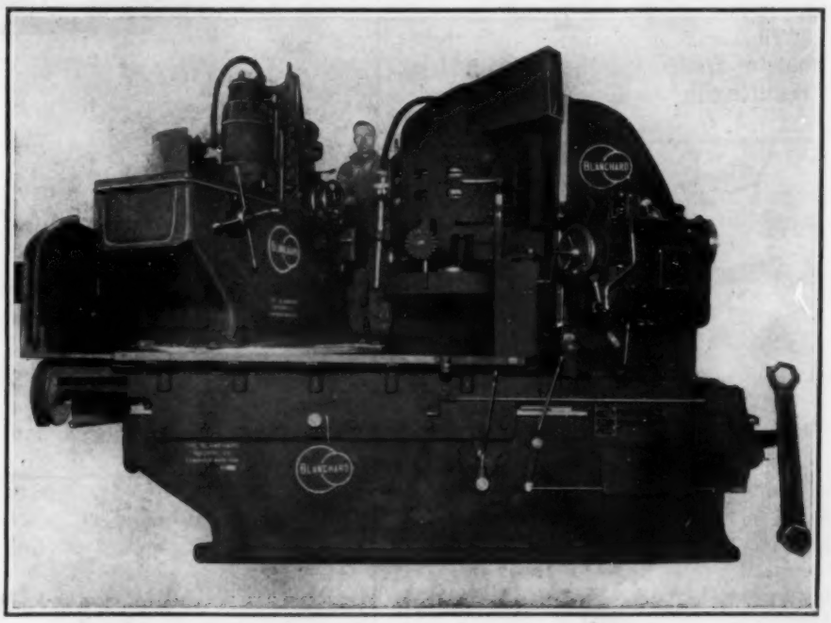
The cylinders of the air motor which drives the spindle of the tool are of the double-acting type and are provided with a packing gland which prevents leakage of air into the crankcase. Each piston has two packing rings and is accurately ground to size. The connecting rods are attached to a crosshead as in a steam engine, obviating the use of a connecting rod toggle and preventing side thrust of the pistons against the cylinder walls.

The valves are of the balanced piston type and are operated by eccentrics which are forged integral with the crankshaft. The ports from the valves to the cylinders are made as short as possible in order to effect economy in the use of air. The crankshaft is forged from nickel steel and the eccentrics are located between the cranks. The crankshaft is mounted on three ball bearings and is geared to the spindle by a stub-tooth gear and pinion.

A splash system is used for lubrication of the moving parts. The spindle is of the extension type with a tang slot for ejection of the reamer or drill. The machine weighs 35 pounds, so that it is easily portable, and it is also well-balanced.

Blanchard Special No. 27-R Surface Grinder

The Blanchard Machine Co., 64 State St., Cambridge, Mass., has recently completed an exceptionally large surface grinder, built on the general design of the No. 27-R machine previously described on page 641, Vol. 56, of the *American Machinist*.



Blanchard Special No. 27-R Surface Grinder

The machine is shown in the accompanying illustration with a No. 10 Blanchard grinder placed on the chuck to show the relative sizes of the machines. It carries a grinding wheel 36 in. in diameter and a 60-in. magnetic chuck with an extension ring 76 in. in diameter added to it. The water guards have also been made wider than on the regular No. 27-R machine, the base of the machine has been lengthened, and other minor changes have been made so that work 84 in. in diameter can be handled.

The wheel head which slides vertically on the column contains a 60-hp., a.c. motor and weighs, complete with a 36-in. grinding wheel, 7,000 lb. It is said that in spite of this weight, which is considerably more than the No. 10 machine shown on the chuck, the head can be accurately controlled through the feed gearing.

The magnetic chuck is of one-piece construction, being machined from a solid steel forging and having no joints from the face of the chuck through to the coils. Four speeds for the chuck are available through sliding gears. The base is cast in

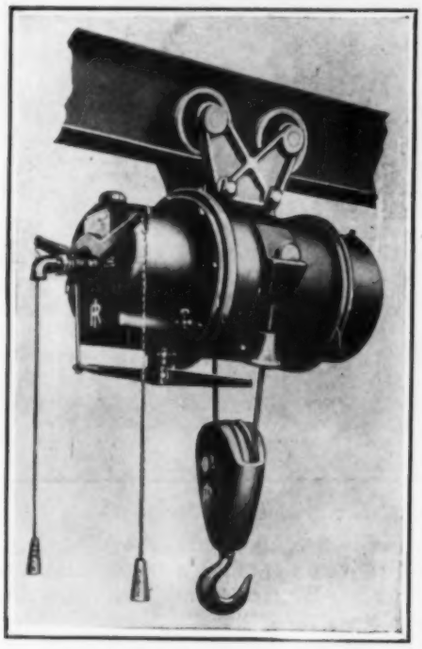
one piece and weighs 11,800 lb., forming a tank for 500 gal. of coolant.

The chuck is traversed by power from the loading to the grinding position and part of the water guards move with it. In unloading there is sufficient clearance for handling the work with a crane. The total weight of the machine is 43,000 lb., and the floor space occupied, without any allowance for working space, is 15½ x 8 feet.

Ingersoll-Rand Heavy Air Motor Hoists

The Ingersoll-Rand Co., 11 Broadway, New York, N. Y., is now marketing a line of air motor hoists with capacities ranging from 500 to 10,000 lb. The 500-lb. hoist was previously described on page 637, Vol. 59, of the *American Machinist*, and four heavier sizes have recently been added, so that the same type of hoist is available for heavier work.

The salient features of these hoists are compactness of design, resulting in low head room required;



Ingersoll-Rand Heavy Air Motor Hoist

relatively light weight; an automatic brake which holds the load when the air supply is shut off or disconnected; and a graduated throttle which provides close regulation.

A balanced three-cylinder motor provides the power, and is said to possess exceptional freedom from vibration, ability to run slowly at all loads, and absence of lubrication troubles, even when subjected to considerable neglect. The motors are geared through mechanical trains to the hoisting drums, a safety stop lever being provided to stop the motor when the load is raised to the top of the lift. Both motor and gears are enclosed and oil passages lead to all bearings, ball bearings or bronze bushings being provided at all necessary points.

Le Blond Heavy-Duty Portable Lathes

The R. K. Le Blond Machine Tool Co., Cincinnati, Ohio, is now marketing a series of three heavy-duty portable lathes, including 11-, 15-, and 17-in. sizes. The 15-in. portable lathe is illustrated in Fig. 1 and it will be noted that the machine is mounted on three substantial wheels, so that it may be brought up to the work and cut in on any electric-power circuit available.

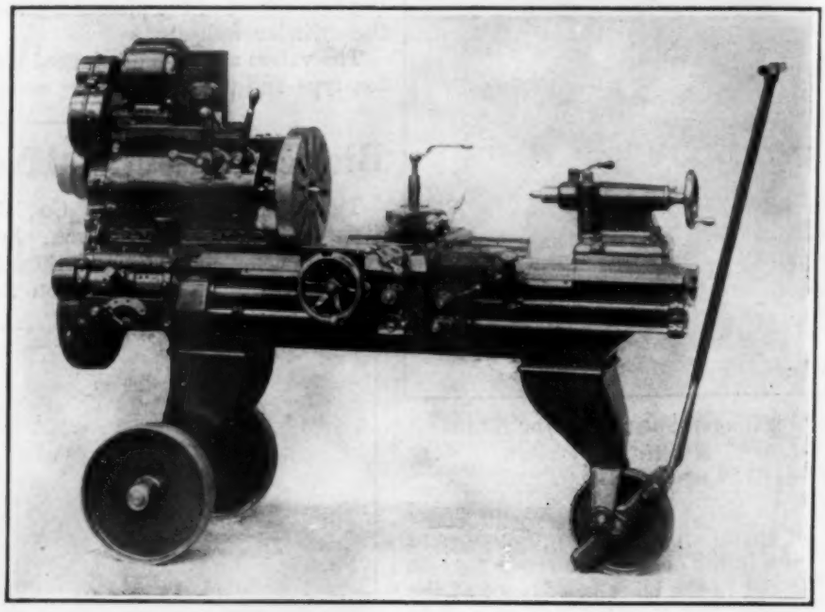
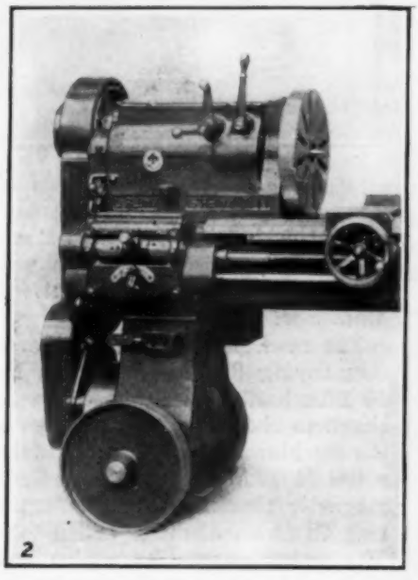


Fig. 1—Le Blond 15-in. Portable Lathe with geared motor

The other two sizes are mounted



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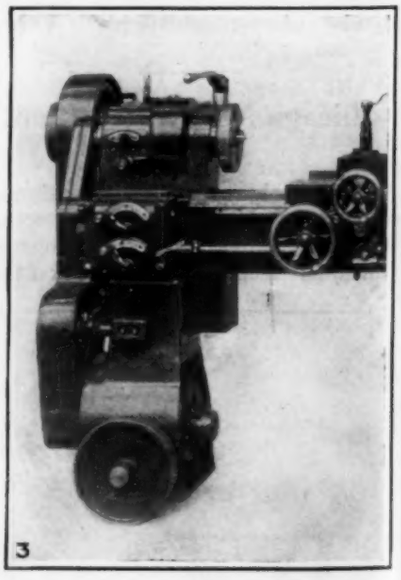

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Fig. 2—Le Blond 15-in. portable lathe with belted motor *Fig. 3—Le Blond 11-in. portable lathe with belter motor*

in the same way. The handle at the end of the machine is attached in such a way that it secures the machine to the floor when released and moves to the position shown, so that the machine takes up no more floor space than an ordinary lathe.

The lathe in Fig. 1 is provided with a constant-speed, geared motor drive, in which construction the motor is mounted on the head and drives the broad-faced gear, which replaces the driving pulley, through a bakelite intermediate gear. Figs. 2 and 3 show the head ends of the 15- and 11-in. lathes, respectively, with constant-speed belted motor drives. In this arrangement the motor drives the pulley through a leather belt for which a suitable tightener is provided. With the belt drive the motors are inclosed in the base of the front leg of the lathe. The belted drive only is furnished for the 11-in. lathe.

The controlling apparatus is an integral part of these portable machines and it is only necessary to carry current to the switch. A mechanical stop, start and brake operated from the front of the headstock is furnished, so that only plain starters or controllers for the motors are required.

Selective Speed Headstocks

The headstocks of these lathes are of the selective speed type providing a range of six speeds on the 11-in., nine on the 15-in., and twelve on the 17-in. lathe. The entire range of speeds is controlled by two levers. Flood lubrication is employed in the heads.

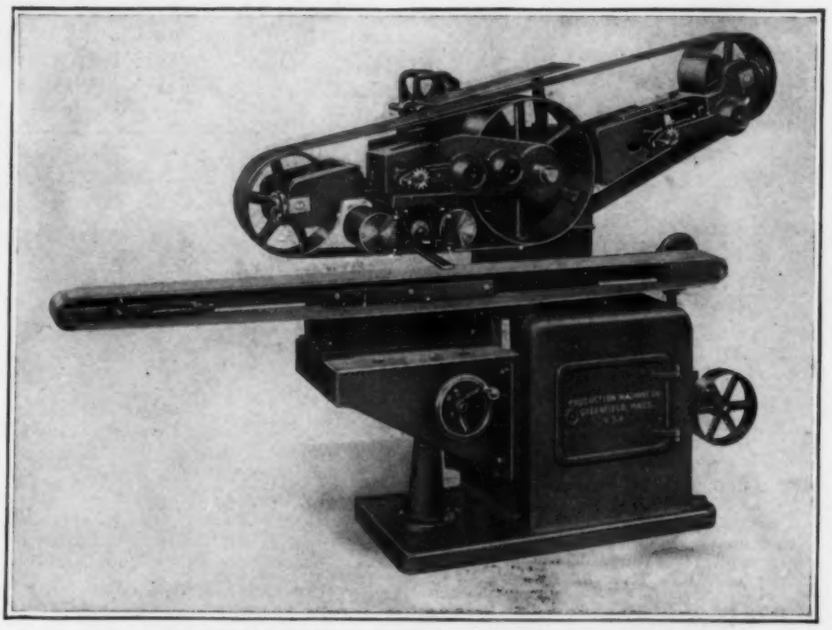
The aprons are of the box-section design in which all shafts and studs have a bearing at each end. Both longitudinal and transverse feeds are controlled by a single positive jaw clutch. The 15-and 17-in. sizes are regularly fitted with a quick-change geared feed mechanism for screw-cutting, but the 11-in, lathe has a simplified geared feed mechanism, providing nine changes of feed for turning, facing and boring. The quick-change mechanism provides a range of 32 feeds and threads for the larger sizes.

The motors required vary from 3 hp. for the 11-in., to 5 hp. for the 17-in. machine, and should run at 1,200 r.p.m. The three sizes weigh, respectively, 1,560, 2,265 and 3,300 pounds with the base lengths of bed. These lengths are 4 ft. for the 11-in. machine, and 6 ft. for the others.

Production Machine Co. Finishing Machine for Flat Work

The Production Machine Co., Greenfield, Mass., has recently added to its line of abrasive belt grinders a Type F machine, adapted to the finishing or polishing of flat work. On flat work which is not too complicated in contour, this machine will handle parts automatically, and pieces from $\frac{1}{16}$ to 4 in. in thickness can be handled. The limiting width of work is 5½ in. and the maximum possible length is 18 inches.

As shown in the accompanying illustration, a cabinet base supports at one side an adjustable knee, on which is mounted a belt conveyor. The work is placed on the conveyor and carried under the abrasive belt. A column at the rear of the base carries the belt pulleys and their driving mechanism. Two belts are used, a short leather belt providing backing at the grinding position for the longer abrasive belt.



Production Machine Co. Type F Finishing Machine

The machine is driven through tight and loose pulleys, the tight pulley being 8 in. in diameter with a 5-in. face. The pulley shaft runs at 1,500 r.p.m., and the conveyor countershaft at 720 r.p.m. This gives a conveyor surface speed of 8 ft. per min. To operate the machine 10 hp. is required. All shafts are provided with compression grease cups and the main bearings and idler pulleys are equipped with floating bronze bushings.

The two idler pulleys at the ends of the machine, over which the abrasive belt runs, are 12 in. in diameter, and the main drive pulley for the leather cushion belt is 18 in. in diameter. The latter pulley is mounted upon the driving pulley shaft of the machine. The pulley and belt arrangement is clearly shown in the illustration.

The operator has only to load the parts to be finished on the belt conveyor and they are then carried under the abrasive belt to the delivery end of the conveyor where a receptacle may be placed. Work shorter than 6 in. may be laid on wooden blocks attached to the conveyor belt. It is unnecessary to clamp the work to the blocks, but pins must be provided for the work to thrust against.

For work longer than 6 in. the wooden blocks are not attached to the belt, but cleats are provided to take the thrust of the work. The polishing of pieces which have flat surfaces but which cannot be handled to advantage on the belt may be accomplished by the use of hand fixtures. The various thicknesses of work are accommodated by raising or lowering the table or knee on which the work conveyor is mounted. The floor space occupied by the machine is 45x104 in., and the height is 62 inches.

Forbes & Myers Model 106 Tool Grinder

The method used for cooling the motor is the distinctive feature of the Model 106 tool grinder, recently placed on the market by Forbes & Myers, 172 Union St., Worcester, Mass., and shown in Fig. 1. When motors are exposed to dust and grit, as on grinding machines, it is of

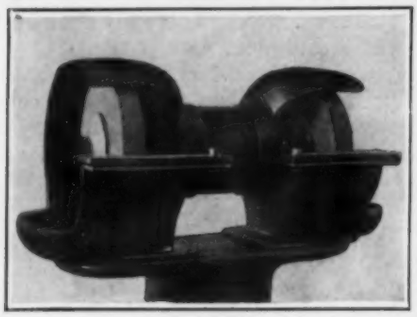


Fig. 1—Forbes & Myers Model 106 Tool Grinder

advantage to have all electrical parts enclosed, but such construction under ordinary conditions tends to keep the heat in. It is then necessary to make the enclosed motor somewhat larger than an open, air-cooled motor for the same power.

It is claimed that the motor of this grinder combines the advantages of both types, and it is fully enclosed

Fig. 2—Rotor, shaft and windings

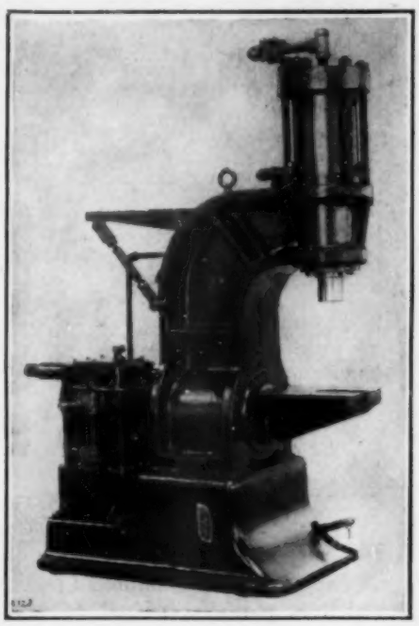
so that no dust or grit can get to the windings or bearings. Fig. 2 shows one end of the motor with the wheel guards and bearings removed. It will be seen that two fans are attached at one end of the rotor and these blow a current of air across the windings and against the aluminum wheel guards. These guards are good heat conductors and dissipate the heat readily to the outer air.

The motor is rated at ¾ hp. and is of the squirrel-cage induction type, built for 2- or 3-phase, 25-, 40-, or 60-cycle current, and for any voltage under 600. The rotor is mounted in ball bearings which are packed with grease.

The grinder carries two 10 x 1½-in. wheels and runs at 1,800 r.p.m. on 60-cycle current. The tool rests are supported on the aluminum casting, which forms the frame of the motor and the wheel guards, and are adjustable. The spindle is 1 in. in diameter at the wheels and the wheel flanges are 5 in. in diameter.

Oilgear Hydraulic Riveter

A self-contained hydraulic riveter, built in two sizes with pressures of 10 and 20 tons respectively, has recently been placed on the market by the Oilgear Co., 398-408 Thirty-eighth St., Milwaukee, Wis. The



Oilgear Hydraulic Riveter

machine is constructed as a self-contained unit so that it may be placed in a convenient position on the shop floor and driven from any constant-speed source of power.

The pump equipment consists of a type WE Oilgear constant-pressure pump and, since the pressure is instantly available when the resistance is met, there is no delay in waiting for pressure to build up. The pump furnishes oil to the cylinder under steady pressure and free from pulsations. The delivery of the pump is instantly variable from zero to maximum and its displacement is positive against any resistance up to the capacity of the machine. The box-section base of the machine has an extension at the rear on which the pump is mounted. The upper frame is bolted to the base and carries the vertical ram cylinder, below which the removable work table or horn is mounted in a suitably machined socket.

The horn shown in the accompanying illustration is of a special design to accommodate an indexing fixture, and removable horns of any design can be used. The operator controls the machine by means of a treadle, and both hands are left free for the manipulation of the work. The speed of the machine is only limited by the adeptness of the operator in placing rivets.

The stroke is 4 in. and the work can be so positioned that the ram just clears the work at the top of its stroke. It is claimed that this machine does superior riveting work, since each rivet is subjected to a quick squeeze.

Ames No. 55 Dial Gage with Bezel Lock

The B. C. Ames Co., Waltham, Mass., is now marketing its No. 55 dial gage equipped with a bezel lock.

Ames No. 55 Dial Gage with Bezel Lock

The No. 55 gage was described on page 350, Vol. 58, of the *American Machinist*, and the addition of the bezel lock, which is furnished as special equipment when desired, is desirable when the gage is to be set and operated in one position for some time.

The lock is particularly useful where the gage is subject to vibrations or contacts which might change the position of the bezel. The lock is positive and does not interfere with the setting of the bezel.

News of the Week

Japan's Electrical Machinery Needs Outlined by General Tripp

American manufacturers must co-operate with Orient

American manufacturers must be prepared to help in the financing of foreign power developments and to co-operate in the expanding of electric service, if we are to develop our foreign trade on an extensive scale. This opinion was firmly expressed by General Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Co., who has just returned from a trip around the world, in which he visited Japan, the Philippines, China, India and Europe. It was during his stay in Japan that General Tripp consummated the arrangements whereby the Westinghouse Electric & Manufacturing Co. together with the Westinghouse International Co. joined in co-operative agreements with the Mitsubishi interests and Takata & Co. to bring about more rapid developments in electrical manufacture in Japan.

The Japanese people, General Tripp stated, are re-establishing themselves from an electrical standpoint very rapidly. Only one of the large power properties was seriously damaged by the earthquake, although the destruction of transmission and distribution lines was considerable in the devastated district. A very large volume of installation work will be required in the rebuilding of Tokio, Yokohama and other communities within the zone of destruction. The great bulk of Japanese activity in the electrical field, however, is concerned with the expansion of the superpower system, which is rapidly being extended through the building of new hydro-electric stations and the interconnection of existing plants.

America's Share

A very large portion of this business will undoubtedly come to America, General Tripp asserted. Indeed, American electrical manufacturers can count on a large share of the Japanese market for many years to come. True, the Japanese are gradually developing the manufacture of electrical products themselves, and the trend is undoubtedly toward an increased activity in this field. Large results will require a number of years, however. During this period American exports will gradually decrease. Small motors, small wiring devices, appliances and similar lines will naturally be the principal field of Japanese activity for the present.

The best market for American manufactures will be in the field of large apparatus and equipment, but it is highly improbable that Japan will ever fully satisfy its own market, and the American manufacturers can, therefore, count on a sustained demand for their goods if they are properly established. The most assured basis will be through permanent affiliations between American and Japanese manufacturers who will co-operatively develop and sustain markets for standard lines. Meanwhile Japan is buying as intelligently as we would do in this country, selecting materials for quality and maintaining a high standard of construction that assures permanence of investment. The type of hydro-electric development now being installed compares favorably with the best practice in this country.

Interesting developments in the radio field will probably be seen before a great while in Japan. At present there is no broadcasting whatever, and a strong sentiment is forming in favor of the expansion of this service either under government control or on some other basis. With the institution of broadcasting there should be a large development in the market for radio materials.

Japan Most Progressive

"In the Far East," said General Tripp, "Japan is an outstanding figure. She alone of all the Oriental nations needs no extensive help from Europe or America. Though the destruction caused by the earthquake was enormous, it was not an unmixed evil. The destroyed cities will be rebuilt on a very much better scale and the buildings will be as nearly proof against earthquakes as it is possible to make them. The Japanese are doing the reconstruction work themselves, and the technical and financial experience thus gained will undoubtedly be worth the price to this progressive and energetic nation.

"In the Philippines, China, India and other Asiatic countries, there are prospects for extensive industrial developments, but, generally speaking, they will be made by Europeans, Americans and Japanese. There is, apparently, no racial desire for improvements and progress as we understand these words. China is a conspicuous example of the Oriental tendency to resist Occidental ideas."

The American business man must not be deceived by the idea that Asia is industrially comparable with Europe or America, General Tripp stated. China, for instance, is progressing electrically only in the treaty ports, and Great Britain continues to wield the strongest influence over her markets for the reason that British trade has long been well established and has built up local traditions which have won the attention and the confidence of the native dealers.

General Tripp devoted most of his time to the Far East and made no extended investigation of conditions in Europe. He reports that the export business of the Westinghouse company has very materially increased during the last year under new organization plans. The outlook for increased export sales is promising. He stressed, however, the importance of recognition on the part of American manufacturers that they owe a responsibility to their foreign customers to extend practical co-operation, assisting them in the generation and utilization of electrical power, both through aid in financing their projects and through guidance in their commercial developments.

Roads Show Gain in 1923

Class 1 railroads, representing a total mileage of 235,667 miles, earned 5.10 per cent on their tentative valuation in 1923, according to complete reports for the year compiled by the Bureau of Railway Economics from returns to the Interstate Commerce Commission and made available last week. In dollars this represents a net operating income of $977,543,590. The same roads in 1922 earned a net operating income of $776,880,592, which was a rate of return of 4.14 per cent.

In the Eastern district the rate earned in 1923 was 5.40 per cent, in the Southern district 5.84 per cent, and in the Western district 4.57 per cent. Net operating income is what is left of the revenues after the payment of operating expenses, taxes, and equipment rentals, but before interest and other fixed charges are paid.

Expenses Increased

Operating revenues of the Class 1 carriers in 1923, according to the complete reports for the year, amounted to $6,356,883,424, an increase of $736,481,703, or 13.1 per cent over the year 1922. Their total operating expenses amounted to $4,944,011,124, an increase of $486,388,653, or 10.9 per cent.

Class 1 carriers during 1923 expended for maintenance of way and structures $821,380,867, an increase of $85,199,655 or 11.6 per cent over such expenditures in 1922. For maintenance of equipment, in order to meet the heaviest demand for transportation in the history of the nation, $1,474,931,328 was spent, an increase over the year before of $214,394,414, or 17.1 per cent.

Steel Production Is Best Since June

Report from trade circles indicate that the steel industry is now operating at the highest levels since June of last year. The reports are received with much enthusiasm inasmuch as it had been predicted that a let-up would start this month in the production of ingots.

The output of ingots by the United States Steel Corp. is nearly 94½ per cent of capacity against 92 per cent a week ago and 91 per cent two weeks ago. This record is the highest reached since the week of June 7, when the average was 95 per cent.

Operations of the independents are being carried on at 82 per cent of capacity, against 80 per cent a week ago and 77 per cent two weeks ago. Much of this activity is to be found in the central west, although the Carnegie steel plants at Pittsburgh are unusually active.

Blast furnace operations for the industry show another gain of 2 per cent, the average being 81 per cent, against 79 per cent a week ago. About four weeks ago the average was 69 per cent. Further additions to blast furnace capacity are contemplated by both the Steel corporation and independents.

Chicago Furnaces Busy

A report received here from Chicago recently stated the Illinois Steel Co. has blown in an additional blast furnace at the Gary works, making eleven furnaces in blast. It has been decided by the management to blow in the twelfth furnace and that plant will be in operation in March.

The demand for steel from the railroads for equipment continues to grow. The New York Central R.R. has definitely placed orders for 8,000 cars of the 17,000 cars for which the road inquired. The Carnegie Steel Co. has just booked orders for 55,000 tons of various steel products for car orders recently distributed by the Norfolk & Western Railway. The steel orders were placed by several car markets.

An inquiry for 12,000 cars from the Pennsylvania R.R. is still in the market and is being actively figured upon by car manufacturers. The company wants 8,000 box cars, 3,000 automobile cars and 1,000 stock cars. At the same time the Louisville and Nashville R.R. is inquiring for 4,000 cars.

Machinery Makers Will Confer with Dealers

Elaborate arrangements are being made for the forthcoming triple convention of the America Supply and Machinery Association, the National Supply and Machinery Dealers Association and the Southern Supply and Machinery Dealers Association that will be held in Cleveland at the Hotel Cleveland, May 19, 20 and 21. Emphasis is being given to the fact that in this line of business the jobber is practically eliminated and the dealer buys direct from the manufacturer in the majority of cases. Holding these meetings together enables the dealers to tell makers what is needed and for makers to help dealers in sales campaigns and in other ways.

The scheme of meeting is to hold separate executive meetings of each association in the morning and combined meetings in the afternoon. During the convention group meetings will be held. Dixon C. Williams is chairman of the pipe tool and fittings group, F. H. McIsaac is chairman of the bolt and screw group, Horace Disston is chairman of the small tool group, H. S. Demarest is chairman of the general supplies group, Charles W. Beaver is chairman of the machinery and equipment group, and J. A. Beynon is chairman of the belting and transmission group.

Stringent Trade Mark Law in France

An official document has just been issued wherein is called to the attention of importers that they may not bring in any foreign product which bears a descriptive name already in use. The special case cited is with respect to an importation of cooking stoves from Germany known as the "Imperial," a name it is noted already in use in France as well as in England. Swiss watches marketed, or in part assembled, in France must bear the distinctive Swiss designation even on parts. The observation holds good with respect to clocks and watches.

In a general way all metal plaques, or woven labels for clothing, must, if imported from abroad, bear on the face the fact of their foreign manufacture, a regulation which will be difficult of carrying out on so trivial a thing as a mere label. This may be said, as with regard to the other measures noted, to be a stringent drawing up of the protection idea to apply to many things hitherto ignored or not thought worth while.

Convention Plans for A. S. T. M.

The twenty-seventh annual meeting of the American Society for Testing Materials will be held at Chalfonte-Haddon Hall, Atlantic City, N. J., during the week of June 23, according to announcements that have been sent out to the members of the society. It is expected that the first day of the meeting will be devoted to committee meetings and that the general sessions will not start before Tuesday morning.

The program that is now being arranged promises to be filled with exceptional papers and discussions and the committee in charge of this work is making every effort to see to it that the business sessions this year surpass even those that were held last year.

The entertainment side of the convention is being ably taken care of by a committee under the guidance of W. M. Corse. Mr. Corse was chairman of this committee last year and the success of his entertainment features is well remembered. Golf and tennis tournaments are schedule for the recreation afternoon.

Trade Statistics Will Be Used

The following statement expresses the attitude of the Department of Commerce in regard to the publication by it of statistics received from trade associations:

The recent correspondence between this Department and the Attorney General relative to the legality of the collection, compilation and distribution by trade associations of statistics or general information has caused widespread discussion and the Department has been frequently asked for a statement as to its policy for the future.

The Department of Commerce will continue to publish its monthly Survey of Current Business, in connection with which it has been receiving information and statistics from various associations. For the purposes of this and other publications and the performance of other duties imposed upon it by law, the Department will, from time to time, request associations to furnish it with such statistics as may be necessary or convenient for its purposes. The information which associations furnish will be used, within the limits of Department appropriations and facilities, in the publications to the extent that it proves suitable.

The Department is not at present in a position to distribute the information received otherwise than through its publications.

The Department does not express any views as to the legal status of any association from which it receives the information, or any approval of its activities.

Baldwin Report Shows Large Earnings

The report of the Baldwin Locomotive Works for 1923 shows the largest gross business transacted by the company since 1918, and the second largest annual total in its history. Gross sales last year aggregated $102,762,075, against $33,087,259 in 1922 and $123,179,252 in 1918, the latter total being the highest on record. Operating income last year was $10,184,755, the third largest on record. After allowing for all charges, including taxes, depreciation, regular preferred dividends and other deductions, there was reported a balance equal to $25.58 a share on the $20,000,000 common stock outstanding. In 1922 there was a balance equal to $19.03 a share on the common. The favorable showing of 1922 was due primarily to the payment of special dividends on the stock of the Standard Steel Works, which is owned by the Baldwin organization.

An outstanding feature in the 1923 report is the deducting of $2,800,000 from profits to be set aside for a dividend reserve for 1924. This amount is equal to dividend requirements on the preferred and common stock for the full year 1924 at the current rate of 7 per cent annually paid on each issue, according to statements recently made by company officials.

Bolt Simplification Recommended

After adopting recommendations calling for the elimination of more than 40 per cent of types of plow bolts, representatives of the manufacturers of bolts and nuts and of agricultural implements, the United States Chamber of Commerce and the American Engineering Standards' Sectional Committee embracing 26 other industrial groups, recently came to an agreement on what should constitute standard sizes of carriage bolts and nuts used in the agricultural implement trade. The conference also voted to recommend to all manufacturers, distributors and consumers that the new program should become effective on new production on Jan. 1, 1925, and on existing stocks on Jan. 1, 1926. The meeting was held in the Department of Commerce, under the auspices of the Division of Simplified Practice, William A. Durgin of the division presiding.

HOOVER'S VIEW

Simplification, Secretary of Commerce Hoover told the conference, represents one of the foremost steps in the reduction of manufacturing costs. Through simplification, trade associations are enabled to make contributions on a sound basis to our industry and commerce. The progress reported by the conference, he continued, would be of value to the farmer, and he congratulated the members on their achievements.

A. E. Norton, chairman of the Sectional Committee, outlining the value of the conference from a technical standpoint, stated that the steps taken today would affect certain exports. He estimated that the standardization steps made by this conference in conjunction with other groups would eventually bring about the elimination of more than 50 per cent of the present number of open-end wrench sizes.

Gage Committee Holds Meeting

The plain gage sub-committee of the American Society of Mechanical Engineers held a meeting at the Bureau of Standards, Washington, D. C., on Feb. 14. There was a good representation from the army, the navy and from various industries.

Considerable progress was made toward the adoption of standards for gages to be used in securing practical working tolerances on gages for the manufacture of interchangeable work. This committee has already published suggestions for standard tolerances on the various kinds of fits used in different classes of work, these being in accord with the standard practice of some of the best shops.

It is the aim of this committee to have its report thoroughly practical in every way so that its recommendations can be used by all classes of manufacturers. The final report will show how machine work with different degrees of interchangeability can be made to standard tolerances which should eliminate much misunderstanding and aid both makers and users of machinery of all kinds. There is no desire on the part of the committee to force its findings on anyone, but they hope instead, to make their standards so practical that they will be used more and more as they become better known.

Railroads Are Buying More Freight Cars

The New York Central R.R. has placed contracts for 8,000 new freight cars. The business is understood to have been divided between the American Car & Foundry Co., and the Standard Steel Car Co. The order is part of a total of 17,000 cars for which the railroad is in the market. The Pennsylvania R.R. and the Louisville & Nashville R.R. are also in the market for large quantities of cars.

The Illinois Steel Co., a subsidiary of the United States Steel Corp., received a contract from the United Railways of St. Louis for 3,000 tons of rails. A good demand for light rails as well as for tie plates has been reported in the Chicago district.

Slight Decrease in Cost of Living

The cost of living in the United States on Jan. 15, 1924 had decreased two-tenths of one per cent from the level of Dec. 15, 1923 as shown by figures just collected by the National Industrial Conference Board. In the month from Dec. 15, 1923 to Jan. 15, 1924 there was an increase in the average cost of clothing and decreases for fuel and food. These changes were each less than one per cent. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and January 1924, the cost of living decreased 19.5 per cent.

Prof. Stoughton the Speaker

The New York Chapter of the American Society for Steel Treating held a meeting Feb. 19 at the Machinery Club, 50 Church St., New York City. Bradley Stoughton, professor of metallurgy, Lehigh University, spoke on, "Heat Treatment of Cast Iron," and his subject was followed by a general discussion by the members.

WE'RE ALMOST THAT FAR ALONG ALREADY

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J. N. Ding in the N. Y. Tribune

Personals

FREDERICK E. MOSKOVICS has been elected vice-president of the Franklin Automobile Co., Syracuse, N. Y. Mr. Moskovics was for the past ten years vice-president of the Nordyke & Marmon Co., Indianapolis, Ind. He will continue as receiver for the Stevenson Gear Co., Indianapolis.

GEORGE F. ATWATER, for several years in charge of the cost department of the Fafnir Bearing Co., New Britain, Conn., and at one time superintendent of the New Britain division, Connecticut Light & Power Co., was elected to fill the newly created position of assistant treasurer at the annual meeting of the Fafnir Bearings Co.

CLINTON S. SMITH, employment manager at the Ashcroft Works of Manning, Maxwell & Moore, Inc., Bridgeport, Conn., has resigned and will assume the duties of personnel manager of the Westinghouse Electric Products Co., Mansfield, Ohio.

JOHN ROBERTSON, for the past ten years manager of the Winnipeg branch of the Sawyer-Massey Co. has been appointed manager of the Regina branch of the Waterloo Manufacturing Co. of Waterloo, Ont., thresher and tractor manufacturer.

GEORGE A. MORISON, secretary of the Bucyrus Co., South Milwaukee, Wis., has been notified of his selection as one of eighteen nominees from whom will be chosen six overseers of Harvard University by a mail ballot among 40,000 alumni.

A. E. OWEN has been appointed assistant purchasing agent of the Pennsylvania R.R., with headquarters at Chicago.

BURTON G. TREMAINE, JR., has recently been elected president of the Superior Screw, Nut & Bolt Co., Cleveland, Ohio.

J. A. CAMM, president and a member of the board of directors of the Western Iron Stores Co., Milwaukee, Wis., has resigned, effective April 1. His plans for the future have not been announced.

G. P. ROGERS has resigned as general sales and advertising manager of the Pyrene Manufacturing Co., Newark, N. J., to become vice-president of the Kant Rust Products Corp., Rahway, New Jersey.

W. E. DUNHAM, formerly assistant to the general superintendent of motive power and machinery of the Chicago & Northwestern R.R., has been promoted to superintendent of the car division, succeeding T. H. GOODNOW, who has resigned.

E. R. HART has been appointed consulting engineer of the New York, Chicago & St. Louis R.R., with headquarters in Cleveland.

C. E. PERKINS has been appointed general manager of the recently opened Buffalo office of D. R. Clarkson & Co., Rochester. The new office is located at 41 Erie St.

PROF. ELIHU THOMSON, one of the founders of the General Electric Co. and holder of over 700 patents covering electrical devices, has been honored with the degree of Doctor of Laws by the University of Pennsylvania. Professor Thomson is director of the Thomson Laboratory of the General Electric Co. at Lynn, Mass.

H. A. SHIER, district sales manager at Pittsburgh for the Onondaga Steel Co., Syracuse, N. Y., will sever his connections on March 1 with that company to take up the duties of district sales manager at Pittsburgh for the steel sales department of Henry Disston & Sons, Inc., Philadelphia, Pa. Mr. Shier has been representing the Onondaga company for eight years and prior to that was with the Bethlehem Steel Co. in the tool steel sales division for eight years.

E. W. OLIVER, manager of the electric lines of the Canadian National Railways, has returned from Europe where he has been studying Diesel engines and electrical equipment.

W. A. UMPHREY, of the Weidely Motor Co., Indianapolis, Ind., has announced that operations at the plant will resume in about two weeks. Pending some litigation in the courts and a re-organization of the personnel of the management, the factory has been shut down for several months.

THOMAS S. GATES of Drexel & Co. has been made chairman of the Baldwin Locomotive board of directors.

HOWARD MACNEAL, formerly with the Philadelphia plant of the Link-Belt Co., has been transferred to the Chicago plant.

RUFUS S. COLE has been appointed as export representative of the Hupp Motor Car Corp.

E. P. BULLARD, of the Bullard Machine Tool Co., Bridgeport, Conn., is in Bermuda on a vacation for six weeks.

P. K. HEXTER of New York City has been appointed vice-president and director of sales of the Selden Truck Corp. of Rochester.

HARRY MEIXELL has resigned the secretaryship of the motor vehicle conference committee to become general manager of the Mortgage & Title Guaranty Co. of New Jersey. He also leaves the post of secretary of the legislative committee of the National Automobile Chamber of Commerce.

Fox Motor Co. Sale on March 24

By order of the United States District Court for the Eastern District of Pennsylvania, the plant of the Fox Motor Co., 7th St. and Grange Ave., near Tabor Station, Philadelphia, will be sold at a receiver's sale in Equity by Samuel T. Freeman & Co., auctioneers, of Philadelphia. The plant equipment will be sold in piecemeal lots only and includes real estate, good will and patents, service rights, machinery and equipment of the type usually found in such a plant. Attention is called to the fact that the date of the sale is Monday, March 24 and not Monday, March 10 as erroneously announced in several of the advertisements of the sale.

Business Items

The organization meeting of the new Remington-Noiseless Corp. was held last week and eight directors were elected. They are B. L. Winchell, C. W. Colby, F. S. Fitzpatrick, H. G. Fuller, G. E. Warren, G. K. Morrow, D. E. Woodhull and F. A. Huck. The following officers were elected: Mr. Winchell, president; Mr. Colby, chairman of the board; C. S. Ashdown, W. J. Pickering and A. C. Forrest, vice-presidents; E. J. Saxer, treasurer, and H. E. Smith, secretary.

An auction sale of factory equipment will be held March 14 at Newcastle, Del., of Plant C of the American Manganese Steel Co. The sale includes traveling cranes, steam boilers, electric generators, drill presses, converters, hoists, grinders, foundry machinery, woodworking machinery, etc.

A trustee's sale of equipment of the West Virginia Metal Products Corp., Fairmont, W. Va., will be held on March 8. Complete machine shop, blacksmith shop, casting shop, brass rolling mill, copper rolling mill and other parts of the plant will be offered.

Expansion of the Gotfredson Truck Corp. of Detroit by the purchase of the Harroun Motors plant at Wayne was announced last week. The Harroun plant is said to be one of the finest automobile plants in the country, composed of two main buildings, having a total floor space of 228,000 sq.ft.

The Florida Co-Operative Machinery Works, of Tampa, Fla., manufacturer of agricultural machinery, plans removal of its $100,000 plant to Birmingham, Ala.

The American Radiator Co. of Buffalo has moved part of its machine tool department to its subsidiary plant, the Detroit Lubricator Co. The object of the move is to get like operations under one roof and only the machinery used in brass working on valves and regulators has been moved. The iron working machinery will still be operated in what has been the Buffalo machine tool department, but will be under direct plant supervision.

The plant of the Greenduck Manufacturing Co., 2127 Tilden Ave., Chicago, was destroyed by fire on Feb. 18. Machinery and contents, valued at $400,000 were destroyed. This concern produced metal stampings.

Clermont Motors, Ltd., has been incorporated at Montreal with a capital of $140,000, to manufacture and deal in vehicles of all kinds, the principal incorporator being George N. Clermont of Montreal.

The Twinvolute Pump & Manufacturing Co., of Newark, N. J., manufacturer of high duty centrifugal pumps, has been acquired by the John H. McGowan Co., of Cincinnati, Ohio. The contents of the Newark factory are being moved to the McGowan plant and the Twinvolute line will be added to the McGowan products.

The Mitchell Motor Car Co. of Racine, Wis., has been organized for the purpose of acquiring a full complement of units and parts for Mitchell automobiles and giving replacement service to Mitchell owners. It has been given exclusive rights to officially provide parts by the trustee of the bankrupt Mitchell Motors Co., Inc., of Racine, the assets of which have been liquidated. L. H. Bridgman has been elected president, and Dallas E. Winslow sales manager of the new parts service concern, which has opened headquarters in Racine. Shop facilities have been arranged for so that direct service may be given and replacement parts no longer in stock for older models produced on order.

The Anniston Foundry Co., Anniston, Ala., has started reconstruction of the part of its plant and shops destroyed recently by fire at a loss of $25,000.

Production has started in the new plant of the Edwards Railway Motor Car Co., at Sanford, N. C., under construction for some months.

At a meeting recently of the Lincoln Machine Co., Minerva, Ohio, the following officers were elected: President, J. P. Messimore; vice-president, Fred Riessen; secretary-treasurer, W. G. Kryder. The directors are Thomas Hughes, W. G. Kryder, Fred Riesen, J. P. Messimore and W. R. Kurtz.

The new plant of the Stanley Works, New Britain, Conn., was recently opened in that city. The new building is 60x200 ft. and three stories high.

The plant formerly operated by the D. A. Tompkins Machine Co., at Charlotte, N. C., one of the first machinery manufacturing companies established in the Southeast, has been sold to M. C. Propst and associates, of Charlotte.

The Central Foundry Co., of Anniston, Ala., is re-building the plant destroyed by fire recently at a loss of $100,000, according to E. P. Cooper, manager of the company.

The Indianapolis branch of E. A. Kinsey & Co., Cincinnati, Ohio, is being enlarged.

Announcement has been made of the purchase of the Michigan Pressed Steel Co., 126 South Artillery Ave., Detroit, Mich., by the Motor City Stamping Co., formerly located on Hart Ave.

The Duplex Truck Co., will move into its new and enlarged plant in Lansing, March 1, according to Joseph Gerson, president of the company.

The Commonwealth Edison Co., Chicago, plans to spend for new construction this year a total of $29,500,000, or $2,000,000 more than was spent for extensions and improvements in 1923, according to Samuel Insull, the president. About 45 per cent of the $26,900,000 spent in 1923 was for generating station extensions, and the remaining 55 per cent for other additions to the Illinois company's system.

The Errington Mechanical Laboratory of New York has opened a Chicago branch at 612 West Adams St., under the management of Paul A. Koerber.

The Canadian Pacific Railway added over $12,000,000 worth of new equipment to its rolling stock during 1923. Included in the new equipment were 36 locomotives, 27 steel baggage and express cars, 27 first class parlor cars, 1,000 box cars, 250 refrigerator cars, 300 coal cars and 50 large oil tank cars.

Damage of $50,000 was caused by a fire recently to the four-story plant of the Wallace Barnes Co., Bristol, Conn., now used as a motor car storage warehouse.

At a meeting of the stockholders of the New Britain Machine Co., New Britain, Conn., the board of directors was re-elected.

The Sullivan Machinery Co., Chicago, reports net earnings of $1,843,967 in 1923, against $1,428,746 in 1922. After all charges for reserves and depreciation there was reported net income of $1,266,379, against $895,611. The surplus, after dividends, was $617,310 against $421,900.

Obituaries

EDWIN DAVIS, aged 82 years, retired manufacturer, dropped dead in Canton, Ohio, recently. He was associated with the Gilliam Manufacturing Co., bearing maker, the Eller Hardware Manufacturing Co. and other Canton concerns.

HENRY F. KELLERMAN died recently at his home in Baltimore. Mr. Kellerman was well known as a mechanical engineer.

RICHARD TRIMBLE, formerly secretary-treasurer of the United States Steel Corp., died recently at his home in New York City. Mr. Trimble suffered a stroke of paralysis three years ago and had been partially incapacitated since that time. He was interested in the Union Steel Co., the Tennessee Coal, Iron and Railroad Co., the Elgin, Joliet & Eastern R.R., the Federal Shipbuilding Co. and the Lake Superior Consolidated Iron Mining Co.

Spain a Potential Market Says Young

Adverse exchange conditions are laying a very serious handicap upon American manufacturers in almost every European country except Spain, and in the opinion of H. W. Young, president of the Delta-Star Electric Co., Chicago, little business can be done while this situation prevails. Spain, however, does offer a considerable opportunity to American exporters. Mr. Young has just returned from an extended trip abroad and has made a careful study of conditions surrounding high-tension transmission on the European continent. Switzerland, he says, is unable to sell any materials to the surrounding countries, as Swiss exchange is about on a par with ours, but France and Germany are in a much better position in this respect.

Kelly Elected Head of A. I. M. E.

The annual business session of the American Institute of Mining and Metallurgical Engineers, held last week during the annual convention in New York City, was attended by about fifty members including representatives of several of the New York sections. Following the reading of the minutes of the 1923 meeting, President E. P. Mathewson gave a brief report of the activities during his administration. Secretary Sharpless called attention to his printed report as presented to the directors, this also including reports from the membership and library committees.

Announcement of officers for 1924 was made, the report of the tellers being as follows: President, William Kelly; vice-presidents, E. L. De Golyer and Charles W. Merrill; directors, R. V. Norris, George Otis Smith, P. B. Butler, L. D. Ricketts and Bertram D. Quarrie.

SUGGESTIONS OFFERED

H. A. Wheeler, representing the St. Louis session, suggested fewer directorate meetings as a means of securing greater co-operation among the membership. He also stated that the withdrawal of the A.I.M.E. from the Federated American Engineering Societies was deplored by the membership in the St. Louis section. Col. A. S. Dwight outlined the part the Institute had played in the activities of the Federated and pointed out the fact that action on the part of the Institute directorate to withdraw had been prompted by lack of funds. R. A. Parker, of Denver, and Jay A. Carpenter, of Los Angeles, spoke briefly on behalf of their sections.

Standard Parts Co. Wins Patent Suit

The Standard Parts Co. won a patent suit against Wm. J. Peck when the Supreme court, Feb. 18, reversed a decision by the circuit court of appeals. The patent involved was on a machine used in making axles and springs. Peck was employed to develop certain ideas, and did so. He then asserted the right to the patent. The Supreme court held that the development was in his line of duty and that he had been employed and paid for that specific purpose.

Discusses Belt Transmission

The New Britain section of the American Society of Mechanical Engineers held a meeting at the Central Junior High School, New Britain, Conn., Feb. 19 at which time Louis W. Arny, secretary of the Leather Belt Exchange, spoke upon belting and belt transmission. The lecture was illustrated with lantern slides and a discussion followed Mr. Arny's talk. The meeting was well attended by New England engineers and manufacturers and much interest was shown.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Canada

An unusually heavy demand is developing throughout Canada for portable saw-mills. Reports from all sections of the country are to the effect that orders for these machines are piling up and plants are being rushed to capacity.

Machine tools are moving somewhat more briskly now. The automotive interests are placing heavy orders for supplies. Most mills are working practically at capacity. Orders for thirty-five new pieces of standard passenger train equipment have been placed by the Canadian National Railways with firms in Montreal and Hamilton. While the locomotive needs of the Canadian railways have not yet been made public, they are thought to be large.

The steel mills are at present exceptionally busy on large orders. The rail mills of the British Empire Steel Co. at Sydney are running to capacity on orders for the C.N.R., while the Algoma Steel Corp. at Sault Ste. Marie recently received an order from the C.P.R. for fifty tons of rails to be used on the company's western lines. The mills at the Soo are at present working on a big order for the C.N.R. Engineering firms report a fair amount of business on hand.

Chicago

Business continues to improve in both the new and used machinery and machine tool market in the Chicago district. The several recent auction sales of used equipment have not affected the used machinery market to any appreciable extent. Dealers report that there is a better feeling among machinery and tool buyers than has been in evidence for several months and prospects are good. Industrial buying of single tools has predominated the sales during the week. The contemplated purchases by railroads is the basis for belief in good future business.

The Chicago, Milwaukee & St. Paul Ry., the Missouri Pacific Ry., the Chesapeake & Ohio R.R. and Pennsylvania R.R. have lists outstanding in this territory. Joseph T. Ryerson & Sons, Chicago, sold five nail machines to a steel concern at Johnstown, Pa., and also four nail machines to the Steel Co. of Canada.

The Atchison, Topeka & Santa Fe Ry. has asked for bids on the following equipment: One hydraulic hand power bushing press; one staybolt and radial stay threading machine, one nut facing machine, one 18½-in.x6-ft. cabinet brass turret lathe, one 42-in. boring mill; one 54-in. truck and trailer tire turning lathe; one 100-in. heavy duty type boring and turning mill; one 50-in. vertical boring mill; one double punch and shear with a 40-in. throat; one horizontal plain high power milling machine; one 30-in.x24-ft. selective head engine lathe; one boiler plate flanging clamp, 10 ft. between housings; and one 26-in. heavy duty crank slotter with at least a 4-speed drive.

Milwaukee

February business of machine tool manufacturers in Milwaukee represents a moderate gain over the previous month, but in a majority of instances deliveries as well as new orders fall slightly under the corresponding month a year ago. The month, however, developed better business than the average for the second half of 1923. One of the most satisfying developments this month has been a small increase in unfilled orders, compared with a month ago.

Automobile shops continue to be the predominating factor in tool trade. Particularly in the line of milling machines is this true. Railroad buying in this market still is of small proportions, although some fair business has been worked with railroads for local and nearby shops.

On the whole, machine tool business has not been getting past the barrier marked by purely replacement needs, save only in the automobile industry, but here the buying is confined to a small number of the largest makers, and their needs for greater capacity are apparently at rest for the time being.

Inquiry for used and new machinery has been such that dealers as well as manufacturers of equipment are confident that the month of March will show further progress over that represented by gains in sales in January and February, compared with the latter months of 1923.

Southern District

Southern dealers report a fair improvement in February machine tool sales over last February, in spite of the fact that business was exceptionally brisk the early part of 1923. The biggest volume is from Southern railroads that have announced several additional construction projects during the past two weeks, mostly in increased shop facilities, that are creating a big demand for heavier machine tools. The Southern System announced an additional project at Birmingham, Ala., for a locomotive and car repair plant to cost $3,000,000, construction to begin immediately. New equipment will be used throughout. An $800,000 investment will be carried out at New Orleans improving terminal and shop facilities by the Louisville & Nashville Co. The Southern also announced recently a $250,000 shop building project for Spartansburg, S. C., early this year. At Montgomery, Ala., the Atlantic Coast Line will erect new shop facilities. The Central of Georgia will start this month rebuilding shops at Savannah, Ga., at a cost of $350,000. For many of these projects equipment has yet to be purchased, and inquiries from Southern railroads for heavier tools have increased in volume.

The trade reports quite an improvement in mill supply business since Feb. 1, exclusive of the railroads.

Detroit

Automobile prices have started upward as a forecast of an unusually heavy demand for cars this spring. Four advances were made last week, another was announced this week, and others are expected to follow.

Heavy purchasing remains the order of the day in the machinery and machine tool lines, as increased production figures for automobile plants mount. Some of Detroit's smaller shops are not enjoying the prosperity which is attending the larger manufacturers and dealers, it is said. This is due, in large measure, to keen competition among the smaller manufacturers.

Business is likely to be heavy in the industry for the next four or five months at least. Plans are now being made for the models which will be announced during the summer and fall months. As a consequence machinery in Detroit is needed.

Indianapolis

From the manner in which business is opening up since the first of the year, there appears to be no cause for serious worry on the part of the Indianapolis industries. Business during the first two months will compare favorably with the business of the same period last year. Machinery activity seems to be expanding somewhat. The demand is spotty, however, some lines being in the market rather actively, while others do well to hold their own. Demand from the automobile industry is good.

Business remains rather slow with the fabricating plants here, but the outlook is promising, judging from their inquiries. Those plants that specialize on steel for construction purposes are not inclined to buy.

At Anderson, Ind., are two large file factories. Both report a big business. Officials of the Continental File Works there, have made some increases in the working force, while officials of the Nicholson File Works say the last two weeks have seen a decided increase in orders from automobile industries and railroads.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance*, New York

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MORE scared than hurt, describes the condition of business in the United States today. Washington has been made so hysterical by the rumors in circulation there that the President has found it necessary to issue a reassuring announcement pointing out that the disclosures made or impending will not injure business and should prevent further malfeasance in office.

The passage of the Mellon tax reduction bill, of which many had hoped so much, now appears unlikely, and Liberty Bonds are lower because it is feared that any further reduction in the public debt will be made impossible by the payment of a bonus.

The possibility that stock dividends will be made taxable as income upon their distribution has increased the disappointment of those who may receive them, and out of the welter of scandal revealed and rumored there is arising the spectre of a third party led by a radical nominee for the presidency.

Europe also has a case of "nerves" which has been aggravated by the dockers' strike in England and the continued decline in the French franc, which has sold at 4.12½ cents, the lowest price on record. Poincare's proposal to increase French taxes by 20 per cent has been carried by a small majority in the Chamber of Deputies, but it still lacks the approval of the Senate and it is felt that a change of Government at Paris and the possible evacuation of the Ruhr may be near at hand.

The pessimism engendered by these developments has led to some selling of stocks and cotton, the moral effect has been dispiriting and as the week closed there was a widespread fear that "the worst is yet to happen."

In such circumstances it is generally safe to assume that the worst *has* happened and *has* been discounted. The President is right; the venality thus far known or any that may hereafter be revealed will be so condemned that the standard of public service will be immeasurably raised. In this sense the oil scandal is a guarantee of better government in the future.

As to taxes it is well to bear in mind that they will be no heavier, and in fact somewhat lighter, than they have been for the last few years, during which period the country has been exceptionally prosperous and those who fear the bonus should not forget that the President has said that he will veto it and that it is still a long way off from enactment.

To the European outlook the same common sense generalizations seem applicable. The dockers' strike is already ended. England would have starved otherwise, and strikes never last forever. A change of government in France would also be a good thing if it should lead to an abandonment of the policy that has driven Poincare toward the rocks of national bankruptcy.

The result would probably be the co-operation of Great Britain in collecting from Germany whatever she is able to pay and the possible adoption of General Dawes' suggestion that a mortgage of ten billion gold marks upon the German railroads should be distributed ratably in accordance with the Versailles treaty.

For these reasons and because it is nearly always wise to buy when everyone wants to sell, purchases now seem to be more advisable than sales. It is platitudinous to say that lower prices attract buyers, but it is perhaps worth while to call attention to the fact that they are already having this effect in many markets. Despite the decline in the raw material there is a distinct improvement in the demand for cotton goods.

Woolen and worsted fabrics are also moving more freely because the American Woolen Co. has had the good sense not to advance its prices for fall delivery. Nearly every other important staple except rubber is also moving normally from producer to consumer, and coffee is strong at a substantial advance, largely because the continued inflation in Brazil makes it difficult to replenish the small American stocks.

The steel industry is working at nearly its full capacity. Copper is up to 13½ cents. Most of the non-ferrous metals are higher. Wheat and corn have remained remarkably steady considering the demoralization. The class I railways earned nearly a billion dollars net in 1923. Car loadings for 1924 indicate a continuance of the record-breaking traffic, and in so far as the statistics of business are concerned it may be truthfully said that "every prospect pleases and only man is vile."

There is little or no unemployment. Credit is abundant. The unused resources of the banks and the Federal Reserve System guarantee easy money with a possible reduction in interest rates, and unless the American people lose their heads and allow themselves to be stampeded by the political developments at Washington the year 1924 ought to be one of the most prosperous in the history of the country. A boom would be undesirable and is not to be expected during a presidential campaign, but a normal, rapid and profitable distribution of the products of industry and agriculture is indicated and will be witnessed provided we don't lose confidence in ourselves and our institutions, or mistakenly conclude that our excellent home will be made permanently untenantable because a thorough house-cleaning has become necessary.

What's Doing in Industry

Machine tool business continues satisfactory in most parts of the country, although the Eastern section is still complaining of slow sales in spite of the unusual number of inquiries. Railroad buying has been spirited during the past week and allied lines such as car builders and locomotive makers have purchased machine tools in New York, Chicago and Cincinnati. Detroit and Chicago both report good business and there is no let down in sight for at least the next six weeks.

Electrical business continues to thrive and, according to authorities in that field, business in all branches is good for this time of the year.

Copper and other metals have been in steady demand during the past week and further improvement is looked for during the next two months.

The steel mills have sent out optimistic reports on production both present and future and this industry is expected to be kept busy during the entire year.

Washington disturbances have had smaller effect upon stocks than was actually expected. There have been some slumps in prices and volume of sales but quick recoveries have characteriezd the market generally.

Germany's Nightmare and Awakening

With labor submissive, capital now faces the problems of re-financing and competing with the rest of the world—A long road, dimly lighted is before them

By Our Berlin Correspondent

THE chaos into which the economic life of Germany has sunk after the final collapse of the paper mark and the Ruhr war seems to mark the end of the post-war evolution. A new era of up-hill work has commenced for industry. The receding inflation tide left prices of German manufacture high and dry, fairly towering above those of the rest of the world. Computation of prices on a gold mark basis has cleared the atmosphere. Many things hidden in the hothouse mist of inflation times have become sharply revealed. The truth dawned upon manufacturers that something was fundamentally wrong with their cost problem. This fact spelt ruin unless a change, a radical and speedy change, were made. That such apprehensions were not unfounded became apparent very soon.

The front-rank establishments doubtless can weather the storm brewing and hold out for some considerable time, but in many of the weaker ones the flag of distress is being unfurled, ready for hoisting if pressure becomes too strong. To stall off the crisis a large number of works found it necessary to retrench behind the last strongholds or to shut down completely.

This lightning-speed change from apparent prosperity to a more or less pronounced state of distress is no doubt without parallel in history. Faced by the darkest prospects manufacturers were soon galvanized into action. From the display of energy seen so far, it is clear that they want to break a way through to pre-war conditions, tear down the whole edifice of post-war evolution as far as it stands in their way and start again cn the point left when the war commenced.

The Labor Problem

The first subject tackled was, of course, the labor problem. In the eyes of most manufacturers this problem with all its ramifications is the root of all evil. The labor unions have at no time during post-war years, not even when labor was scarce, shown sympathy for labor saving methods. The policy which they succeeded in enforcing can be summed up in a few words; work for as much as possible and no preference given as to payment. Few manufacturers have dared to attack it openly for fear of reprisals from the side of the labor unions.

But finally the employers demanded the abolishment of the eight-hour day. By the eight-hour day they meant the whole complex of questions summed up under the term revolutionary labor achievements; that is, the restrictions against discharging workmen at will, of the piece-work system, and levelled wages. The consecutive development is memorable for various reasons, not the least one of which is the disclosure of the true strength of the labor position. The wage question and piece-work payment formed part of the so-called collective tariff agreements. The fight was initiated in the Ruhr where industrialists cancelled all existing agreements with labor, challenging at the same time not only the laboring classes, but the whole governmental labor policy of post-war time. Extension of working time submitted to pre-war labor regulations was demanded as a condition for the resumption of work.

> "The front rank establishments doubtless can weather the storm brewing and hold out for some considerable time, but in many of the weaker ones the flag of distress is being unfurled, ready for hoisting if pressure becomes too strong. To stall off the crisis, a large number of works found it necessary to retrench behind the last strongholds or to shut down completely."

Encouraged by this example, employers all over the country followed the lead of the Ruhr industrialists. The resistance of the working classes and labor unions was rather weak. The strikes and riots started by the radical labor section found little support with the majority of workmen. Inflation had eaten up the strike funds, the wolf was before the door and workmen refused to starve for the sake of their principles.

The Government Steps In

Into this situation dropped a new ordinance of the government regulating labor conditions. While this ordinance gave the impression of a continuation of the expired demolization ordinances with a few modifications, the enforcement of pre-war labor conditions spread with undiminished speed. The puzzle thus presented is explained by a closer scrutiny of the new ordinance, which, while restricting the extension of the working time by one-sided dictates, leaves a wide road open to new regulation by agreements between employers and employees. It was doubtless meant only as a protection of the working classes against excesses on the side of employers in a situation where the balance of strength lies decidedly with the latter. The result seen so far may be summed up in the observation that the so-called revolutionary labor achievements have almost disappeared from the scene.

The machine building industry has again the ten-hour work day with one or two hours less on Saturdays, liberty to re-establish the principle of paying by results, and old-time control in the management of the working force. The shop councils alone remain, greatly weakened, though, as regards their influence on management as well as on the workmen. Hand in hand with this momentous retrograde evolution went the establishment of standards for wages on a gold basis.

Up to Management and Engineers for Results

The scene seems now cleared for action. The labor situation leaves little to be desired. It is now up to management and engineers to show results. In this respect opinion in manufacturing circles is not in unison. A large section of them believe that the return to pre-war labor conditions is all that is required. They seem to overlook that in the stages "higher up" a similar process of regeneration is highly necessary. Of course the wholesale sifting of the working force and personnel, which so far has resulted in an accumulation of over three million unemployed in the country and the enforcement of strictest economy, will at once produce results up to a certain limit, but it seems that further progress will be slow and tedious. Manufacturers and engineers had little time and opportunity to learn much during past years. Besides, they have to unlearn a good deal. The sense for economy has been left behind in the tropical wilderness of the inflation period and will have to be revived. Many time-honored rules have been forgotten by the old and have never been implanted in the new generation of engineers. The evolution in other countries in the matter of shop management has passed by Germany almost unnoticed. It will take many months, perhaps years, to make up for time lost.

The present situation of few or no new orders and a lot of unsold stock finds most German manufacturers absolutely at sea, regarding costs. The necessary process of re-adjustment of prices would doubtless enact itself much speedier if manufacturers knew exactly what their products cost them. As it is, each waits for the "other fellow" to make the first move. Starting from basic products the inflation of prices is receding, but very slowly. Manufacturers are holding on as long as possible. There is, however, an agency gaining force which is bound to soon accelerate the downward movement, i.e. the financial calamity.

The re-adjustment of labor conditions having been achieved successfully, the replenishing of the working capital is the most important task of the day. The re-establishment of the gold mark standard has reduced the working capital of industry to absolute insufficiency. The wealth of the industry is to be found in stocked produce and material. The capital at the disposal of manufacturers is absurdly small.

Credit being exceedingly tight, manufacturers are cramped to a degree not yet experienced.

A striking example of the financial status of German manufacturers is offered by the case of the Reinecker Co. one of the foremost German machine tool works and one of the best situated financially. In the balance sheet of the company just issued drawn up on a gold mark basis the assets are given as follows:

Building land	1,880,000 G. M.
Buildings	1,218,600 G. M.
Debitors including ... } Bank credit ..... }	382,600 G. M.
Securities	13,800 G. M.
Stock	4,102,000 G. M.
	7,597,000 G. M.

The nominal capital of the company which originally was four million marks has during the war been raised to six million marks and since then to twenty-four million marks. The company is now compelled to valuate its capital at 7.2 million marks and to reduce the book value of its reserves from six million marks to 926,700 marks. The gold mark profit of the company in the last business year was 76,159 marks out of which a dividend of 3 gold marks per share of nominal 1,000 marks is paid. In pre-war years the company paid 12 per cent dividend or 120 marks per share. Assets have been valuated very conservatively. Their true value may indeed be considerably higher. The most interesting part of the statement is the comparative insignificance of liquid assets.

Only a handful of companies have not watered their stock in war and post-war times. Amongst them are Loewe's and quite a fair percentage of other machine tool works. The vast majority will have to reduce their stock capital. Hardly any will be able to do without a substantial increase of working capital. One of the crucial points of the situation is, that if business is to revive, credit will have to be given, as was usual in pre-war times. The German machine building industry alone must have from 3,000 to 4,000 million gold marks of working capital to cover operations for at least three months. Of this vast sum only a fraction is available. As the money market cannot supply the rest and credit cannot be obtained, manufacturers will have to realize on their stock. They are trying to do so now without finding a sufficient number of buyers. The financial props of the price level being weak, another period of "bargain sales" seems approaching which is generally considered absolutely necessary to remove the last vestiges of inflation and as an initial step to reconstruction on a sound basis.

Catalogs Wanted

John Simon, Brunner Street, 76, Vienna, requests catalogs on machine tools and precision tools.

French Make Bid for Russian Business

A private stock company has been formed in Paris called the Société d'Etudes Franco-Russe des Mesures Metriques with the object of sending immediately to Moscow a mission which shall seek to assure the adoption of the metric system of weights and measures in public and private transactions. Whether or not this is camouflage, does not appear, but it may be considered at least as a long shot toward the development of Franco-Russian relations on a scale which has hitherto been found lacking. "Privileges are solicited," is the statement made so far as any public statement has been made.

Among the administrators of the new society is the house of Fichet, the principal manufacturers of safes in France and others interested in metal manufacturing and allied lines.

Trade Catalogs

Portable Air Compressors, Portable Mine-Car Air Compressors and Concrete Breakers. The Sullivan Machinery Co., Chicago, Ill. Three bulletins have been issued by this company on the three topics listed above. Each contains illustrations of the machines at work with sectional drawings of parts of the machines and with text explaining methods of work and the results obtained. Each booklet is perforated for filing.

Belt Data Chart. The Crescent Belt Fastener Co., 247 Park Ave., New York City. This chart is in card form and may be fastened to the wall. Specifications cover leather belting in light, medium and regular weights with recommendations for the most suitable fasteners.

Shim Data Sheets. The Laminated Shim Co., 14th and Governor Place, Long Island City, N. Y. These sheets that are note book size are perforated in such a manner that they may be attached in a note book or filed for future reference. The various uses and the care of shims are outlined and some of sheets contain clearly defined illustrations of the product.

Heavy Stampings. The Federal Pressed Steel Co., Milwaukee, Wis. This booklet shows the various stamped parts of an automobile that are made by this company. By a series of illustrations and drawings combined, the products are clearly described.

Floor. The Norton Co., Worcester, Mass. Flooring for industrial buildings and the various types of flooring made by this company are described in a folder recently issued.

Gears. The Boston Gear Works, Norfolk Downs, Quincy, Mass. The 1924 catalog No. 44 has been issued and is now ready for distribution. Besides describing the company's products, it is also a valuable data book for users of gears. Specifications and tables covering many of the intricate subjects regarding gears are included in the booklet.

Cranes. Herbert Morris, Inc., Buffalo, N. Y. "Thrift in Lifting" is the title of this booklet that is being mailed out. Cranes and pulleys in use are shown by illustration and the advantages of the product of this concern are told in the text.

Automatic Machines. The Cleveland Automatic Machine Co., Cleveland, Ohio. The many products that can be made by the automatic machines manufactured by this company are described and illustrated in the catalog recently issued. The wide usage of the machines are shown by actual examples of valve spindles, cast iron bolster cases, studs, square head pilot screws, parts for bicycles and other products.

Pamphlets Received

Physiological Effects of High Temperatures and Humidities with and without Air Movement. R. R. Sayers and D. Harrington. Treasury Department, United States Public Health Service, Washington, D. C. This is a reprint of a public health report made July 20, 1923 and is an excellent discussion of the effect of temperatures and humidity on metal mine workers. This particular discussion covers only data obtained when the miners were at rest and not at work. The effect of moving air and the effect of no air movement are taken up at length.

Embrittlement of Malleable Cast Iron Resulting from Heat Treatment. Leslie H. Marshall. Department of Commerce, Washington, D. C. This is technologic Paper of the Bureau of Standards, No. 245 and discusses material and tests, treatment in the blue-heat range, effect of varying the quenching temperature, elimination of the embrittlement, and sub-divisions of these subjects.

Industrial Vocational Rehabilitation. House of Representatives, Report No. 164. Government Printing Office, Washington, D. C. This is a report of the committee on education made Feb. 7, with views of the minority embodied in the pamphlet.

Forthcoming Meetings

The Lyons Fair. Lyons, France. March 3 to 17, 1924. Information furnished by Emile Garden, 50 Church St., New York City.

National Metal Trades Association. Twenty-sixth annual convention. Hotel Astor, New York City, April 23 and 24. L. W. Fischer, National Secretary, Peoples Gas Building, Chicago, Ill.

American Gear Manufacturers Association. Spring Meeting. April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

American Society of Mechanical Engineers. Spring meeting. Cleveland, Ohio. May 26, 27, 28 and 29. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

National Association of Purchasing Agents. Annual Convention, Mechanics Hall, Boston, May 20, 21, 22 and 23. W. L. Chandler, secretary, 19 Park Place, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Division V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924. V. R. Hawthorne, secretary, 431 S. Dearborn St., Chicago, Ill.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

American Society for Testing Materials. Twenty-seventh annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. Week of June 23. C. L. Warwick, secretary-treasurer 1,315 Spruce St., Philadelphia, Pa.

American Society for Steel Treating. Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4,600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig-iron inquiries more active; surplus stocks decreasing rapidly. No. 2 foundry iron firm at $23 per ton, Birmingham. Better tone to reinforcing bar market; spring construction requirements bringing out numerous inquiries; quotations mostly at $2.40 per 100 lb., Pittsburgh. Strong competition, however, has developed quotations of $2.35 on desirable tonnages. Some price cutting reported on plates; as low as $2.20@$2.25 having been mentioned on special concessions, against the regular range of $2.30@$2.50. Shapes still $2.40@$2.50 per 100 lb., f.o.b. mill. Present steel sheet prices to hold during second quarter.

Advances—Although buying wave has evidently subsided, present copper price is ½c. per lb. above Feb. 15 level. Lead, antimony, fabricated brass and copper also higher in New York. White and red lead up ½c. per lb. Dealers' purchasing prices of scrap non-ferrous metals advanced slightly in New York and Cleveland.

Declines—Zinc market quiet; price down 15c. per 100 lb. in New York since Feb. 15.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	4.50@4.75
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	3.00	4.34	3.75	4.00
No. 12	3.10	4.39	3.80	4.05
No. 14	3.20	4.44	3.85	4.10
No. 16	3.40	4.54	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.65	4.45	4.70
Nos. 22 and 24	3.75	4.70	4.50	4.70
Nos. 25 and 26	3.80	4.75	4.55	4.75
No. 28	3.85	4.85	4.65	4.85
Galvanized				
Nos. 10 and 11	4.00	4.90	4.70	4.85
Nos. 12 and 14	4.10	5.00	4.80	4.95
Nos. 17 and 21	4.40	5.30	5.10	5.24
Nos. 22 and 24	4.55	5.45	5.25	5.40
No. 26	4.70	5.55	5.50	5.55
No. 28	5.00	5.85	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	8.35
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	3.90	4.30
Cold drawn flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.30
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.12½
Tin, 5-ton lots, New York			55.25
Lead (up to carlots), St. Louis 8.75@9.12½	New York	8.87½@9.87½	
Zinc (up to carlots), St. Louis	6.90	New York	7.35

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	29.00	28.50
Antimony (Chinese), ton spot	12.00	13.00	10.25
Copper sheets, base	21.00	21.25	23.00
Copper wire, base	16.50	19.00	16.25
Copper bars, base	20.00	22.50	19.50
Copper tubing, base	23.00	27.25	23.00
Brass sheets, base	17.75	22.00	18.75
Brass tubing, base	22.00	27.00	20.50
Brass rods, base	15.50	18.00	15.75
Brass wire, base	18.25	22.00	....
Zinc sheets (casks)	10.75	11.00	....
Solder (½ and ⅜), (case lots)	38.00	36.75	30.00
Babbitt metal (83% tin)	60.00	65.00	48@52
Babbitt metal (35% tin)	28.00	21.50	22@25
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.37½	11.00	11.50
Copper, heavy, and wire	10.00	10.50	10.75
Copper, light, and bottoms	8.00	9.50	9.75
Lead, heavy	6.87½	7.00	6.00
Lead, tea	3.62½	4.50	5.00
Brass, heavy, yellow	5.25		7.25
Brass, heavy, red	7.00	9.50	9.00
Brass, light	4.50	5.50	6.25
No. 1 yellow brass turnings	5.00	6.00	6.75
Zinc	3.62½	3.50	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.0
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.14@0.21	$0.20	$0.14
Cotton waste, colored, per lb.	.09@.12½	.17	.10½
Wiping cloths, 13½x13½, per lb	11.00	36.00 per M	.16
Wiping cloths, 13½x20½, per lb.	11.50	52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.97	1.04	.94
Lard cutting oil, 25% lard, per gal.	.58	.50	.67½
Lard oil, pure, per gal, 2 to 5 bbl. lots	.80@1.35	1.01	.97
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber and duck:			
First grade	50–5%	50–10%	40–10%
Second grade	50–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		4.00@4.50
Coke, prompt foundry, Connellsville	per net ton		5.25@6.50
White lead, dry or in oil	100 lb. kegs		New York, 14.75
Red lead, dry	100 lb. kegs		New York, 14.75
Red lead, in oil	100 lb. kegs		New York, 16.25

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0319
Cold finished shafting	per lb.	0.044	0.044	0.0405
Brass rods	per lb	0.155	0.15	0.1812½
Solder (½ and ½)	per lb.	0.3675	0.3475	0.305
Cotton waste	per lb.	.14@.21	.14@.21	.10@.13
Washers, cast iron (⅛ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.58	0.55	0.55
Machine oil	per gal.	0.29	0.29	0.297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	45%	45%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50–5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	45%	.....	60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	35%	50%	50–5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅜ and smaller	65%	.....	.....
Semi-finished nuts, ½ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.50	3.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	50%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.60	$3.75
Cone heads, ditto (net)	5.20	3.80	3.85
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.35	.....	0.15
½ in. diameter *EXTRA*	0.75	.....	0.50
1 in. long, and shorter *EXTRA*	0.75	.....	0.50
Longer than 5 in. *EXTRA*	0.50	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.45	.....	$3.70 base

New and Enlarged Shops

Machine Tools Wanted

Fla., Avon Lake—Roberts & Stebbins, G. A. Stebbins, Purch. Agt.—drill presses, lathes and welding machines for garage.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—6,500 lb. steam pile hammer, f.o.b. Addison; two air receivers, 66 in. diameter, 18 ft. long, factor of safety 5 at 120 lb., 10 in., also oil tank 43 in. diameter, 6 ft. 6 in. long for Dam 44, f.o.b. Leavenworth, Ind.; bolt threading machine with dies; 6 x 6 in. hacksaw; belt driven power hammer; 30 in. bandsaw; pipe threading machine.

Mass., Cambridge—Mack Motor Truck Co., 195 Massachusetts Ave.—machinery for proposed $300,000 machine shop and automobile repair shop (list not complete).

Mo., St. Louis—Brock Eng. Corp., 698 Arcade Bldg., E. J. Brock, Pres.—pipe threading, cutting and bending machinery, etc., for proposed $30,000 assembly plant for feed water purifiers and steam boilers.

Mo., St. Louis—Red Cap Battery Co., 4662 Delmar Blvd.—small bench lathe.

N. Y., Buffalo—A. Wigthet, 1095 Sycamore St.—8 ft. cornice brake, crimping machine and keystone folder, square shear.

N. Y., New York—Hardware Stamping Co., 182 Ave. C—one 36 to 40 in. power squaring shear.

N. Y., New York—Wilson Mfg. Co., 137 Grand St. (manufacturer of tools and dies), A. Wilson, Purch. Agt.—No. 20 Bliss press.

N. Y., Plattsburg—Shepard-Potter Co., Inc., G. P. Sharron, Purch. Agt.—tool room lathe, vises and small hand tools.

N. Y., Watertown—City, J. W. Ackerman, City Mgr.—complete machine tools for repair work at municipal garage.

O., Akron—Akers & Harpham Co., 200 East Mill St.—angle bending machine for ¼ x 1¼ in. circular angles.

O., Cincinnati—Automotive Bearing & Equipment Co., 7 East 8th St., S. C. Feltham, Genl. Mgr.—machine shop equipment.

O., Columbus—Buckeye Window Glass Co., Bonham Ave., C. E. Bartram, Jr., Purch. Agt.—rollers, cutters and other equipment.

O., Columbus—C. A. S. Products Co., 338 East 2nd Ave. (manufacturer of steering gear and automobile specialties), C. A. Brunner, Genl. Mgr.—milling machine, automatic punching machine and boring mill.

O., Columbus—Ohio Concrete Mchy. Co., 129 East Columbus St., H. Miller, Purch. Agt.—one 18 or 24 in. lathe, drill and other metal working machinery.

O., Springfield—Champion Chemical Co.—2 spindle drilling machine.

Tex., Dallas—Peerless Motor Co., 2119 Main St.—16 in. x 8 ft. engine lathe.

Tex., Greenville—F. Riegger—36 in. lathe and 24 in. shaper (used).

Vt., Bennington—Bennington Scale Co., Mill St., H. D. Coffin, Purch. Agt.—one 14 in. x 8 ft. quick change gear lathe, motor driven, also one horizontal and one 50 in. vertical boring machine.

Wis., Janesville—Bower City Stamping Co., c/o R. R. Conway, R. D.—stamping presses.

Wis., Milwaukee—Crown Machine Co., c/o A. R. Buckholz, 946 40th St. (machinist and manufacturer of plated articles)—stamping press, lathes, drill press and shaper.

Wis., Milwaukee—Midwest Ventilating Wks., 720 M. & M. Bank Bldg., R. Murr, Purch. Agt.—sheet metal working machinery.

Wis., West Allis—J. Weitzer, 6404 Natl. Ave.—sheet metal working machinery, including bender, rolls, etc.

Que., Montreal—P. L. Davis, 238 Ontario St., W.—drill press and small lathe for automobile repairs.

Que., Montreal—N. Laroche, 99 Vinet St.—tool room lathe, air compressor and grinding stand.

Que., Montreal—E. Marois, 241 Carriere St. (blacksmith)—forge, grinding stand and drill press.

Que., Montreal—O. Meunier, 12 Maguire St.—drill press and grinder for garage.

Machinery Wanted

Ky., Henderson—Kentucky Box & Crate Co.—woodworking machinery, including bandsaw, tenoner, disk sander, circular ripsaw and single surface planer.

Md., Baltimore—Schluderberg-Kurdle Co., Baltimore and 5th Sts., W. T. Schluderberg, Pres.—equipment for proposed $250,000 addition to packing plant.

Mass., Roxbury (Boston, P. O.)—Berwick Cake Co., 2220 Washington St.—machinery and equipment for proposed $100,000 bakery.

Mich., Detroit—Michigan Alkali Co., Ford Bldg.—alligator shear for cutting 70 lb. rails.

Minn., Hibbing—Universal Advertising Co., G. J. Jackson, Pres.—tinners shears, punches, dies, etc., for the manufacture of electric signs.

Mo., Kansas City—Genl. Petroleum Co., 6th and Walker Sts., E. W. Goebel, Purch. Agt.—electrically operated pumping equipment for proposed oil storage works.

N. Y., Buffalo—City, Room 13, City and County Hall, J. H. Meahl, Purch. Agt.—receiving bids until Mar. 4 for furnishing and installing complete laundry machinery for J. N. Adam Memorial Hospital, Perrysburg.

N. Y., Sacket Harbor—Gowing & Co., Main St. (manufacturer of boats), R. Gowing, Purch. Agt.—bench planer.

N. Y., Waterford—Hudson River Dyeing Corp., F. Talbott, Purch. Agt.—one 42 in. centrifugal blower with 16 in. discharge, also miscellaneous equipment for dyeing plant, 15,000 lb. daily capacity.

N. Y., Watertown—Genl. Shade Roller Corp., Woolworth Bldg., G. B. Aber, Purch. Agt.—special metal stamping machinery for the manufacture of shade roller parts.

N. Y., Watertown—Watertown Radio Service, 112 Park St., J. B. Scott, Purch. Agt.—electrically operated post drill and lathe for magnet winding.

O., Alliance—Alliance Fdry. Co., J. J. Hutmacher, Pres.—complete equipment.

O., Cincinnati—Cincinnati River-Rail Transportation Co., Front and Harriet Sts.—large gantry crane for river terminal.

O., Columbus—Bd. Educ., E. L. McCune, Secy.—manual training equipment, including bandsaw, lathes, jointer, mortiser, table saw, 24 in. planer and trimmer, for New Central High School.

O., Columbus—J. S. Maclean Co., 150 West Spring St. (planing mill)—two cutoff saws, one molding machine, two sanders and other equipment for new plant on South Front St.

Okla., Blackwell—City, R. W. Porter, Supt.—750 kw. steam turbine generator set for electric light plant.

Okla., Pawhuska—City, C. J. Hert, Clk.—285 hp. diesel oil engine with generator and exciter to enlarge electric light plant.

Okla., Ponca City—City, J. W. Crow, Supt.—diesel oil engine generator set, about 1,000 hp., for electric light plant.

Pa., Easton—Pennsylvania Pump & Compressor Co.—7 A Potter & Johnson automatic chucking and turning machine (used).

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co.—cranes for Sharon, Pa.

Pa., Latrobe—Latrobe Ice & Provision Co.—three 20 ton ice machines and three 75 hp. a.c. 3 phase motors, leather belting.

Pa., Pittsburgh—Amer. Sheet & Tin Plate Co., Frick Bldg., M. S. Dennis, Purch. Agt.—one 15 ton crane for Mercer Wks. at Farrell.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg.—duplex hoisting and loading rigs, conveyor equipment for dock at Mingo Junction, Ohio.

Pa., Pittsburgh—N. P. Nelson Iron Wks., 623 Bessemer Bldg. (conveying and elevating machinery)—one air compressor, 600 ft. capacity, also one steam pump and receiver.

W. Va., Charleston—E. H. Morford & Co.—3 drum hoisting engine, 8 x 10 in. swinger attachment and boiler.

Wis., Appleton—C. Minlschmidt, 784 Franklin St.—refrigeration machinery, 5 to 10 ton capacity.

Wis., Marinette—Marinette-Green Bay Mfg. Co., Church St.—excelsior shredding machinery and presses.

Wis., Milwaukee—Central Bd. of Purchases, City Hall, J. W. Nicholson, Purch. Agt.—air drills and riveting hammers.

Wis., Milwaukee—J. J. Jones Co., 1015 3rd St. (millwork), J. Goelzer, Purch. Agt.—one arm sander.

Wis., Milwaukee—Meilahn-Walters Co., 681 3rd St. (manufacturer of baby carriages and furniture), G. W. Meilahn, Purch. Agt.—woodworking and reed working machinery.

Wis., Milwaukee—Pittsburgh Plate Glass Co., 205 Lake St., L. Patton, Purch. Agt.—5 ton traveling crane.

Wis., Milwaukee—Radio Oil Co., 378 Washington St.—air compressor and two gasoline storage tanks and pumps.

Wis., Milwaukee—Red Star Yeast & Products Co., 79 Buffalo St.—ice making machinery, 15 to 20 ton capacity.

Wis., Milwaukee—Reliable Auto Radiator Co., 246 5th St., L. Rifkin, Purch Agt.—8 ft. cornice brake.

Wis., Port Washington—Johannes Pure Food Co., R. 1—machinery for proposed vegetable canning plant.

Wis., Racine—B. D. Eisendrath Tanning Co., West 6th St.—special machinery and equipment for proposed $50,000 addition to tannery.

Wis., West Bend—Amity Leather Products Co.—stamping machines for proposed $50,000 factory.

Ont., Golden Lake—Golden Lake Lumber Co., Ltd.—complete equipment for new sawmill at Renfrew.

Ont., Hamilton—Canadian Westinghouse Co., Aberdeen St., W.—moulding equipment, furnaces for melting metal, also jib and traveling electric cranes for proposed $400,000 foundry.

Ont., Ottawa—Standard Bread Co., Ltd., Hillson Ave.—bread, cake and candy making machinery for proposed $100,000 bakery.

Ont., St. Thomas—S. Young, St. Catherines St.—complete equipment for dairy plant.

Ont., Toronto—Natl. Asphalt Co. of Canada, Ltd., 309 Confederation Life Bldg., A. B. Muir, Secy.—machinery and equipment for plant for the manufacture of bitufiller, a vulcanized asphaltic cement, derived from asphaltic base petroleum.

Ont., Widdifield Sta.—F. Gratton (sawmill)—ripsaw, saw table and swing saw.

Ont., Winchester—M. F. Beach & Co., Ltd. (furniture, sash and door factory), E. Beach, Purch. Agt.—moulder, matcher and sander.

Que., Black Lake—A. Gregoire—shaper and saw table.

Que., Cascades Point—J. B. Juillet (sawmill)—swing saw and bandsaw.

Que., Coaticook—I. H. Peloquin—complete bottling equipment.

Que., Lauriervllle—O. M. Lanouette—hollow arm sander and sash sticker for sash and door factory.

Que., Montreal—M. A. Bradshaw, 1483 Chateaubriaud St.—machinery for the manufacture of boxes.

Que., Montreal—L. Coeman, 395 Bleury St. (cabinet maker)—cutoff saw and shaper.

Que., Robertsonville—E. Carriere—moulder and mortiser for sash and door factory.

Que., Sherbrooke—MacKinnon Steel Co.—traveling or locomotive crane.

Que., Stoke Centre—A. Duplin—self feed ripsaw and other sawmill equipment.

Que., Vaudreuil Sta.—D. Brabant—sash sticker and 4 side moulder for sash and door factory.